# SUPPLEMENT.


# The Mining Journal,

## RAILWAY AND COMMERCIAL GAZETTE:

**FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.**

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## Original Correspondence.

### MINING AND MANUFACTURING INDUSTRY OF SCOTLAND.

#### THE CLIFTON IRONWORKS.

No district in Scotland is so prolific of ironworks as Airdrie and Coatbridge; and on the main road leading between these two places the Clifton Ironworks are situated. They are interesting, not so much on account of their size, for there are many larger establishments in Scotland, as because they are of modern erection, and comprise in their construction and arrangement several of the most recent mechanical improvements. It is nine years since the Messrs. COLVILLE and GRAY laid the foundation of the Clifton Ironworks. Originally composed of only 10 puddling furnaces, they have since been enlarged to 18; and most of the furnaces are built on the principle known as Gorman's patent, of the merits of which the proprietors entertain a very high opinion. At most of the Scotch malleable ironworks Gorman's furnace has now been tried with varying success. In some cases it has yielded the most satisfactory results, and vindicated its claim to be the most economical appliance of the kind in the market. At other works, either through prejudice and ignorance on the part of the workmen, or owing to its inherent defects, it has proved a comparative failure. So far, therefore, its reputation still appears to hang in the balance, for although most, if not all, who have used it are agreed that the Gorman furnace is capable of yielding more economical results than an ordinary puddling furnace, it has been argued that the advantage does not compensate for the difficulty of working it, and its liability to go wrong. As our readers will be aware, the coke, or solid part of coal, is completely burned on the grates of ordinary furnaces, and the combustion of the gaseous part of the coal is thus prevented. In Gorman's furnace the solid part of the coal is converted into carbonic oxide gas, which is combustible, and along with the coal gas is burned with a further supply of air in the part of the furnace where the heat is wanted. By this process the heat from the gas, as well as from the solid part of the coal, is utilised. The chamber where the coal is converted into gas occupies the place of the fire and grate of the ordinary furnace, and it is made much deeper, to ensure that no carbonic acid gas be allowed to escape among the combustible gases. An apparatus called a heat restorer is employed to transfer the greatest amount of heat from the highly heated waste products leaving a furnace to air entering a furnace for combustion. This speciality is based on a very elegant instrument, to which we understand the attention of the patentee was first called in 1844 by the late Mr. Condie, who is well known for his success in overcoming the practical difficulties attending the introduction of the hot-blast. Iron does not burn or waste in the Gorman as it does in the ordinary furnace. The products of combustion in the two furnaces have clearly demonstrated this fact. The effect of the highly oxydising flame of the ordinary furnace in fraying the iron away into cinder is very obvious from the rotten, porous coating of the one, and the effect of the non-oxydising flame of the gas furnace is shown by the more smooth and solid surface of the other, although its highly crystalline fracture proves that it has been completely melted, and consequently that it has been at a higher temperature than the burned iron from the ordinary furnace.

It may interest our readers to be furnished with the following statement recently made of two weeks' work of four of Gorman's furnaces in operation at the Clifton Ironworks:—Sixteen-inch merchant mill—first week, 153 tons 4 cwts.; second week, 154 tons 11 cwts.: total, 307 tons 15 cwts. Total for 22 shifts from two furnaces, 14 tons per shift. Eight-inch guide mill—first week, 117 tons 15 cwts.; second week, 109 tons 18 cwts.: total, 227 tons 14 cwts. Total production two furnaces for 20 shifts, 11 tons 8 cwts. per shift.

Messrs. Colville and Gray have also in operation at the Clifton Ironworks two blast-engines, built on a principle patented by Mr. Wm. Gorman, for blowing, heating, and puddling furnaces. These engines deliver 20,000 cubic feet of air per minute, under a pressure of 36 lbs. per square foot. They are upwards of 20-horse power, and have cylinders of 10-in. diameter. They occupy about 4½ ft. square, and the propeller and blower are on one shaft.

Messrs. Colville and Gray manufacture all kinds of angle, beam, and merchant iron. Their appliances comprise in addition to what we have already noticed, an 18-inch forge train, and a 16-in. merchant mill, driven by a powerful horizontal engine, 28-in. cylinder and 5-ft. stroke. Six boilers, each 30 ft. in length, by 5 ft. diameter, generate steem for the engines. The fly-wheel of the large engine is 21 tons weight. The 8-in. guide-mill is driven by a horizontal engine, with a 20-in. cylinder, and a 2 ft. 9 in. stroke. Convenient to the puddling furnaces there are several steam-hammers, Condie's patent. Like most other establishments of a similar kind, Clifton Ironworks possess kilns for the manufacture of bull-dog for fettling purposes. Then there falls to be enumerated the subordinate appliances, such as shears for cutting the puddled bars, and machinery for punching, shearing, and slotting purposes. We may add that the bars vary from ⅜ to 4½ in. round, and the same size in squares; the angle-iron varies from ⅜ to 5 by 4 in.; while the beam-iron is made up to 8 in. The whole works cover an area of upwards of two and a half acres, and they are laid out with admirable skill, every condition necessary to economise time and labour having been attended to. Ample facilities of carriage and transit are supplied by the North British Railway on the one hand, and by the Monkland Canal on the other. A siding from the railway carries the raw material into the centre of the works, and the manufactured article is carried direct to the loading bank, from whence it can be easily transported to any part of the kingdom. At the present time, and indeed for some months back, the demand for home consumption is so great that Messrs. Colville and Gray have had their powers of production taxed to the utmost; and, from the same gratifying occasion, their export trade has been comparatively limited. Indeed, without making any substantial addition to their plant, they have turned out a larger quantity of stuff during the past three months than they have ever done before in the same time, so that their average production of 9000 tons per annum is just now being considerably exceeded.

Near to the Clifton Ironworks Messrs. Colville and Gray own four coal and shale pits, which afford employment to upwards of 200 hands, making the total number of employees about 500. A range of workshops adjoin the works proper, for making and repairing the machinery. About these shops there is no feature specially worthy of remark. The engineers' shop, which is supplied with an assortment of very excellent tools, is a recent addition. The pattern shop, although small, is sufficient for all the purposes of the works, and the smithy, where all the forge work is done, is supplied with blast by a pair of powerful fans. There is no foundry in connection with the establishment, so that all the castings have to be done elsewhere. We need only add that the Clifton Ironworks appear to possess all the elements of rapid expansion, and that they may fairly be expected, under their present energetic management, to attain to a much greater size and importance.

### IRONWORKS AND COLLIERIES IN YORKSHIRE.

#### THE OAKS COLLIERIES.

There is no colliery in the kingdom, or indeed in the world, so well and familiarly known as "The Oaks," associated as it is with the most terrible catastrophe known in the mining annals of this or any other country. It was here that in the month of December, 1866, by a series of explosions no less than 340 persons were killed (the bodies of nearly 100 of whom still remain in the workings), and where 73 met with almost instant death from a similar cause on March 5, 1846. Great changes, however, have taken place during the last three or four years, the most important of which has been the sinking of a new pit at Ardsley, about a mile from the old one, and the junction of the two at a point near to the Ardsley station. The new pits have made the Oaks Colliery one of the largest and best ventilated in the West Riding, and when all is completed the production of coal will be from 1500 to 2000 tons a day, not less than six distinct shafts being now used in connection with these pits. The principal proprietor and manager is Mr. T. Dymond, one of the most popular colliery proprietors in the district, and whose courage and confidence under the trying ordeal of 1866 gained him wide-spread sympathy, and hearty wishes for success in his future operations. Mr. George Minto has the entire management of the underground work, and Mr. Carr of the top.

The colliery has been carried on under the style of Firth, Barber, and Co., since 1835. In 1862 Mr. Dymond joined the firm, and took the management. From that period the development of the colliery was rapid, so that up to the time of the accident, and also since, the amounts paid in wages have been very much in excess of those paid at any previous time. Mr. Dymond has appreciated, we may say, the generous support he has received since the terrible calamity of 1866, which has been so far ample as to keep the workmen fully employed.

The old colliery is situate about one mile and a quarter south-east of Barnsley, and close to the hamlet of Hoyle Mill, where many of the colliers reside. In it there is one long block of between 60 and 70 houses belonging to the colliery, and which have been seen under many different phases during the last few years. On one occasion, when there was a strike, an attack was made on several cottages occupied by non-Unionists, and the windows, window-frames, and furniture destroyed. In 1864, when another dispute took place, and the old hands were replaced by others, a night attack was made, and the windows again suffered severely. As some of the Unionists, however, still resided in a few of the houses, they painted a large white cross on the outside of such, whilst those tenanted by the non-Unionists had a black cross placed on them gratuitously, so that all should not have favours showered on them alike. The last phase of all was the most sorrowful that can be conceived. The entire rows of houses, on Dec. 14, 1866, had all their blinds down from top to bottom. Every family was in mourning, grief deep, and all but overpowering, reigned supreme, for the explosion had taken from every household some of its "bread winners." Time, however, has dried the tears of the sufferers, so that more than one-half the widows have since re-married.

On proceeding from the houses alluded to, by way of the canal, we come to the office, nearly opposite it being the cupola, and then by the tramway to the pit, the scene of the great calamity. Here all is bustle and activity, for work is now very good for the season. A pumping-engine of 50-horse power is working, drawing the water from the Melton coal field, which is 110 yards deep. The head gear is about 30 ft. high, the pulley wheels 11 ft. in diameter, working two wire-ropes. The drawing-engine is of 90-horse power, with 32-inch cylinder, 7-ft. stroke, there being two single-decked cages pulling two corves side by side. The engine rooms are well appointed, and kept in good condition. In one there are a pair of engines, made in 1858, by R. Inns and Co., of Barnsley Old Foundry, working the engine planes; they are 24-in. cylinders, 5-ft. stroke, with drums 10 ft. in diameter, and pulleys 11 ft. in diameter, the steel ropes connected with them being ⅞ in. in diameter, and passing over and under the two wheels into the inclines. The incline running to the east, known as the Old Plane, is covered at present to the extent of 1200 yards with water, which was sent into the workings immediately after the explosion, to extinguish the fire, so that about 700 yards only are now open. It is believed that the water covers the bodies that still remain in the pit, but the former will be drawn off from the new pit when it is completed. The No. 2 plane is about 1000 yards long, running south-east, and connects the old with the new pit at Ardsley, the great bulk of the coal being raised from that district. At the Old Pit there are two downcast shafts adjoining each other, 7 ft. 6 in. in diameter, the depth to the coal being 285 yards, the dip being about 3 in. in the yard, a few degrees to the south of east. The porches are built of stone, the arches being 12 ft. wide. Every precaution is taken to prevent accidents or accumulations of gas, and no naked lights are allowed in any part of the pit. At the bottom Clanny lamps are used, whilst 80 yards further on, between the engine planes and bank-heads, Stephenson lamps only are allowed. In addition to those precautionary measures no person is allowed to set a lamp on the floor, but must either hold it in the hand or hang it up.

To guard against sudden outbursts of gas—which often occur in both the Barnsley and Silkstone seams—holes in advance and in the floor have been bored at distances ranging from 10 to 12 yards from each other, to allow the gas to escape. The holes are bored through the spavin, under the coal, to the top of a very hard rock, about 30 yards thick. By that means the gas gradually oozes out, instead of accumulating in a body. The box-hole at the bottom, between the two shafts, where the bodies of several of the explorers were found, is now disused, the lamp-cabin being placed at the top of the pit; whilst the "drift," where a shot was fired, and which many persons considered was the cause of the great explosion, is now being made a travelling road. One of the singular features in connection with the Oaks Colliery previous to the explosion was a natural feeder of gas about 1300 yards north-east from the bottom of the shafts, coming from an extensive throw under Burton Grange farm. The quantity made was sufficient to keep from 50 to 60 lamps burning night and day, and was utilised for lighting the pit bottom, the lamp-cabin, and the top of the engine-plane, but was not used in the workings. It was collected in a small gas-holder, but that is now under water, as well as another place, familiar to all who read the evidence given before the coroner after the explosion—"Thompson's box-hole." The cupola, or upcast-shaft, which is used entirely for ventilation, is about 400 yards to the north of the downcast shaft. It is 10 ft. 9 in. in diameter, and, including the cupola, is 289 yards deep. There are two furnaces, each 5 ft. wide, and 6 ft. long. A second cupola is being re-opened, having fallen in so far back as 1851. About 100,000 cubic feet of air now passes through the workings every minute, but that quantity will be very greatly increased after the enlargement of the air-courses, which were very much injured by the explosion. Close to the old colliery there are all the necessary workshops, including those for the blacksmiths, with a small steam-hammer for working up the iron, with circular and upright saws, chopping machines for horse provender, and every essential required for economising manual labour.

The following section shows the different seams of coal passed through to the Barnsley thick bed in the old pit:—

| | Yds. | ft. | in. |
|---|---|---|---|
| Oaks quarry stone, or the red rock | 26 | 0 | 0 |
| Distance | 31 | 0 | 0 |
| Newhill coal | 0 | 3 | 7 |
| Distance (3 yards of good fire-clay) | 55 | 0 | 0 |
| North Wood coal | 0 | 3 | 2 |
| Distance | 17 | 0 | 0 |
| Half-yard coal | 0 | 2 | 0 |
| Distance | 16 | 0 | 0 |
| Abdy coal | 0 | 1 | 2 |
| Distance | 14 | 0 | 0 |
| Beamshaw coal | 0 | 3 | 2 |
| Distance | 4 | 0 | 0 |
| Kent thin coal | 0 | 2 | 2 |
| Distance | 16 | 0 | 0 |
| Coal | 0 | 1 | 7 |
| Distance | 23 | 0 | 0 |
| Kent thick coal | 0 | 5 | 0 |
| Distance | 61 | 0 | 0 |
| Ten-inch coal | 0 | 1 | 0 |
| Boulder | 12 | 0 | 0 |
| Strong bind | 8 | 0 | 0 |
| Barnsley thick coal | 0 | 8 | 8 |
| Total | Yds. 293 | 1 | 6 |

The new pit, close to the Ardsley station of the South Yorkshire Railway, is one of the most complete and well arranged in the West Riding. The sinking, which was under the superintendence of Mr. J. Beaumont, of Oughtibridge, was commenced in July, 1867, and the progress made was not so rapid as it would otherwise have been, owing to the vast quantity of water met with, requiring powerful lifts to clear it. However, in July, 1870, the coal was reached, the sinking having occupied exactly three years, the depth from the surface to the bottom of the seam being 336 yards 1 ft. 4 in., the coal being 8 ft. thick. There are two downcast shafts, each 12 ft. in diameter, upwards of 150 yards from the top of each being tubbed with cast-iron segments, supplied by the Messrs. Dawes, of the Milton and Elsecar Ironworks. The sumps below the coal for the collection of the water are 11 yards deep, and are connected together at the bottom, whilst the arches are of brick, 40 in. in thickness, 20 ft. wide, and 18 ft. high. In sinking, it may be stated that a valuable seam of clay was gone through, and a good deal obtained close to the surface on the adjoining land, so that vast quantities of bricks for the foundations and other work were made on the spot.

The head-gearing at Ardsley is the most complete and massive of any that can probably be found in Yorkshire or in the kingdom, whilst the foundation for the machinery, and the laying out generally, are in every way unexceptionable, and well worth an inspection. The legs or uprights of the head-gear are of fine American pitch pine, 2 feet square at the bottom, tapering to about 20 inches at the top, fixed to strong cast-iron plates 1¾ inches in thickness, with pulleys 16 feet in diameter. Conductors are now being put down, consisting of four wire-ropes, which will be weighted at the bottom, each conductor having attached to it two 3-ton weights, specially cast for the purpose. The cages are to be single-decked, drawing three corfs, side by side. Several screens have already been put down, and others will follow, as it is proposed to have them on both sides of the shaft, as there are branch lines of rails laid down for that purpose on to the South Yorkshire Railway. The bank, where the coal is raised and sent down the screens is 23 feet above the surface, and on it are all the necessary appliances for doing a very extensive business. The coal will be drawn by a pair of engines, with 36-inch cylinder, and 5-feet stroke, made by Thorniwell and Warham, of Burton-on-Trent. The drums are 14 feet in diameter, with flat wire-ropes. Six Cornish boilers, doubled flued, 28 feet long, 7 feet 6 inches in diameter, the flues being 3 feet in diameter, made by Arnold, of Barnsley, supply the motive power. The chimney stack is 120 feet high, and inside at the bottom it 11 feet in diameter.

It is not a little singular that a junction between the two pits took place on the 12th of December last, being the fourth anniversary of the explosion of 1866. It was made at a point 300 yards distant from the Ardsley pit, on the opposite of the line, when 10 bodies were brought out. At the present time two large inclines are being driven out to the south-east and the east to the extent of the boundary, which is about 1600 yards, and into the very heart of the coal field; so that before long there will be a very large increase in the tonnage of coal raised: 800 persons are now employed, but that number will shortly be very largely augmented. The coal field is an extensive one, the principal lessors being Major Wombwell and Mr. R. Micklethwaite, of Ardsley House, whilst the coal itself is of a very good quality, the Oaks "hards" in particular being in brisk demand for the London and other markets, and owing to the present firm being so long in the trade, and from the high character of the steam coal, a good business is done with the principal home railways, as well as with Sheffield and other inland towns. A large quantity is also exported, principally to the North of Europe, India, &c., and has long been placed on the Indian Council and French Admiralty lists.

For the means of thus noticing the Oaks Colliery we may say that we are indebted alike to the kindness of Mr. Dymond, as well as of Mr. Carr and Mr. Minto.

## VENTILATION OF MINES.

SIR,—I read the letter in the Supplement to the *Mining Journal* of June 17 from Mr. John Johnson, C.E., F.G.S., &c., of Chilton Hall, Ferryhill, on this all-important subject. The writer appears to place the furnace as the most powerful and efficient mode of ventilation, even when compared with the mighty fan, which has so justly excited much attention lately. He also offers some remarks on the address of Mr. George Elliot, on the occasion of the experiments with the Usworth fan, and opposes to a certain extent the views of that gentleman in connection with boiler fires and furnaces underground. The remarks of Mr. Elliot with respect to underground fires did not apply solely to the danger of explosions of gas, but more particularly to the danger of underground fires—that is, fires in the coal strata, shale, &c. He stated (and that is too well known) that fires of this kind very frequently occur where furnaces are placed underground. His proposition appeared to us to assume this shape—"That if in an extensive and fiery colliery all lights were excluded excepting safety-lamps, which is now practicable, owing to the introduction of the Guibal fan, the loss of life from underground explosions and fires, &c., would be reduced to a minimum." Now, without contending for the rigid observance of a rule like this in all cases, or for its legislative enactment, we do contend that it is worthy of the most careful study and attention.

We all know the disastrous results to life and property caused at the Felling Colliery about 20 years ago by an explosion proceeding from the furnaces: and, again, a more modern case at the Hetton Colliery, when a number of men were killed, and a cost of 10,000*l.* incurred, from a similar cause, and a volume might be filled with similar cases. And, as the gentleman referred to observed, underground fires can now be entirely avoided, as the ventilation can be produced at the surface by a fan, and the steam (or compressed air) can be conveyed down the shaft for the purpose of working any engines required underground.

It will scarcely be denied that the removal of all underground fires from deep and fiery collieries would tend materially to increase the safety of these mines; the proposition of Mr. Elliot is, therefore, worthy of the utmost attention, and in the great majority of cases also, no doubt, the scheme is worthy of adoption.

With respect to the furnaces at the Eldon Colliery, we have the authority of Mr. Johnson for saying that "On Aug. 6, 1869, I communicated to the newspapers the particulars of some experiments made with these furnaces, showing a maximum quantity of air circulating through the mine of 255,540 cubic feet, as ascertained by an anemometer. This, I believe, was then far beyond the performance of any other furnaces or any other mode of ventilation. In the ordinary rate of working those furnaces the quantity of air passed through the mine amounts to about 200,000 cubic feet per minute, and with such a current, or very much less, I believe that an explosion at a furnace is impossible."

We have here a number of assertions which can only be taken for what they are worth; and we have no means whatever of comparing the power employed at the Eldon collieries with the effect produced, or of comparing similar quantities or powers at the Usworth or any other colliery. We have simply the gross quantity of air in circulation, but no account of the length or area of the air-ways, the water-gauge, or any other particulars.

Certainly the amount of air put into circulation by Mr. Johnson's furnaces is "prodigious," and very great credit is due to him, for the arrangements must be of the very best character, but it is necessary, in order to prove that this furnace excels all other furnaces and modes of ventilation, that we have some particulars as to the size and depth of the shafts, the area and length of the air-ways, and also the cost of the furnaces and air-ways, and the coal consumed. In the absence of all this, which we hope will be furnished by Mr. Johnson, we may safely assume that the shafts at the Eldon Colliery are of considerable depth and large in size, that the air-ways are not of great length, but of considerable area, and a large quantity of coal is consumed at the furnaces.

With respect to the consumption of coal it is not probable that the Eldon Collieries will be more favourably situated than the Hetton Collieries. In Mr. Wood's "Furnaces and Steam Jet," we have the experiments made at Tyne Main Colliery, Jan. 20, 1853:—Total quantity of air, 109,933 cubic feet per minute, and coal consumed in 12 hours, 12,070 lbs., which is equal to 16·76 lbs. per minute, and 6084 cubic feet per minute for each pound of coal consumed.

At the Hetton Colliery experiments, made January 8, 1853:—Total quantity of air, 208,466 cubic feet per minute; and 11,066 cubic feet of air were consumed for each 1 lb. of coal burned. The coal consumed at Hetton is nearly 12 tons per day of 24 hours, in producing 208,466 cubic feet of air per minute; the cost of this coal cannot be estimated at less than 700*l.* per annum. Now, if we assume that the cost of coal consumed at Eldon is in proportion to the cost at Hetton, which is likely to be the case, the cost there per annum will be thus:—Total quantity of air, 255,540 cubic feet per minute. If we assume 15,000 cubic feet of air for 1 lb. of coal we have 11 tons of coal per day, and this must cost not less than 700*l.* per annum—a very large cost as compared with the fan.—*July* 3. VIEWER.

## MINE OWNERS, AND THEIR LESSEES.

SIR,—The leader upon the subject of "Our Coal Supply" in the Journal of June 24 has called for some remarks from the mining engineers of Lord Hatherton relative to the Huntington Colliery Scheme. It only tends to show from what very different points of view the same thing may be observed, or rather how different the same thing may appear to two observers. Let me, therefore, treat of this subject, "Mine Owners, and their Lessees," in the way it presents itself to me. I may be wrong, or I may be right; in any case your readers can form their own judgment. The question is of less importance than it once promised to be, as the Report of the Royal Coal Commission will set our minds at ease for about 1000 years on the subject of our coal supply. Suppose the Commission had shown an opposite result, what would have been the position of mine owners? Is it impossible that a Bill might have been introduced into Parliament providing not only against wasteful processes in working, and a variety of abuses to which the report will, no doubt, call attention, but also providing that mine owners shall not ask more than a prescribed royalty? If the reader will turn to page 459 of the *Mining Journal* for the present year he will find a letter "By an Englishman on the Continent," who says—

"The mining laws of England ought also to receive more attention, for at present the charges made by the lords of the soil on the mine adventurers are often much too high, and a great detriment to the welfare of the country. In Germany the dues on minerals are fixed at 2 per cent., and in almost every other country in the world, Great Britain excepted, the dues on minerals are also fixed by the Government, so that the capitalist and miner are not, as in England, entirely at the mercy of the lords of the soil."

We find that the Legislature steps in and provides for a supervision by its inspectors of all that the lessee does, forcing him to an expenditure of capital considerably beyond what was formerly required to work the same mines, to say nothing of the limitations as to the employment of males, and those of a certain age. So that in this we have a very decided answer to the enquiry—Cannot I do as I like with my own? Thus, if it became necessary for the public good—or, speaking more comprehensively, for the national welfare—the landlords or mine owners, who have hitherto felt little of this kind of interference, would awake to the fact that even *they* may not do as they like with their own. The lords of the soil will shortly realise this in connexion with the proposed Game Laws—not at present carried into effect, it is true, but quite certain eventually to become law. The considerations which really have forced the Game Laws forward upon the public attention are not of a private character. It is not a case of tenants' interests *versus* landlords' interests, in which contention the tenants have proved victors. It is a question affecting our national welfare, which cannot be sacrificed to either private or class interests. It may be admitted that as a means to the end, finding that their interests are served by the proposed measures, societies of agriculturists keep the matter before the public, and urge it forward to the best of their ability; but it must be yielded that the main consideration which upholds this question against the powerful opposition of the landlords themselves is a consideration of it on public grounds. As to rights of property—what has been done in Ireland when it was shown that the community of her inhabitants required the conditions of the law affecting Land Tenure to the altered in order to secure a happy and peaceful condition? Whether the change of law has or will produce that result is another question, but the action of the Legislature all points to this—that the rights of property are only such as the law for the time allows—that the rights of property remain unaltered only so long as the owners use it in such a way as to be of use to themselves, without prejudicing the public welfare. It is not only a human regulation; it is part of the Christian doctrine that we should use in a proper manner the talents with which we are entrusted.

It is well to examine into the aspects of these questions upon a large scale. It is a very easy thing to misconstrue a case by judging of the whole from looking only at a portion. It is a common observation—Cannot I do as I like with my own? If I cannot get what I want for it, I will keep it. If he will not comply with my terms he shall not have it. It must be borne in mind that such language is in reality only possible so long as the Legislature makes no movement to change the present condition of our laws. To many this may appear abstract—inapplicable in the consideration of commercial affairs, and matter with which political economists and theorists may puzzle their brains or those of other people. It is not so in reality. This is, indeed, a great country, singularly blessed, and by the development of its resources rendered the most wealthy and the most powerful. Humanity is, however, moved forward by something more than the mere desire of success. Imperceptibly great principles bear us on, principles which are not the inventions of the human mind, to be brought before the world, judged by it, abandoned or adopted. They are the offsprings of Truth, which, as we know, will prevail; their operations are not observed by all, nor, indeed, by many. We all recognise their effects, and commonly ascribe them to human agency, but it is well for us to know that they are not. There is nothing more common in the world than self-deception, and yet if a man is not honest and truthful to himself what will he be to his neighbours? And thus we talk of things as for ever fixed when they are dependent on the laws of the land and the conventions of society.

If this digression should have tended to show in what way at some future time the mine owner may find himself less the master of the position than he now is, the reader will patiently find an excuse for it. It may be said these things settle themselves by the law of supply and demand. It will certainly operate to some extent, but not entirely as to supersede the possibility of legislative interference. Thus we may suppose for a moment that by limiting the dues or royalties, and economical management of their mines, or by the development of great resources of fuel known to exist, other countries could produce coal not only so cheaply as to render it unnecessary to them to purchase ours, but so cheaply as to make it worth while carrying on those manufacturing processes which have been so long our pride and source of gain, and thus taking from us what for some time past has been a kind of monopoly. Would not our Government, seeing or anticipating such a condition of things, limit the landlords' interest in the mines, and that without compensation? In other words, the interests of the community would not be allowed to suffer because private rights are not satisfied. The mine owners have hitherto been spared from such interference, simply because the favourable position of many of our mines, and the courage and intelligence of lessees, coupled with the advancement of science, helping forward the practice of mining, have enabled us to produce coal sufficiently cheap, even in the face of increased depths and the attendant difficulties, to satisfy our national requirements, without coming upon the landlords for a reduction of their royalties by compulsory enactment.—*Wolverhampton, July* 4. D. S.

## IRON SMELTING—THE FERRIE FURNACE.

SIR,—In the Supplement to the *Mining Journal* of June 3 "No. 1 Ironmaster" vauntingly opened up the whole question of improvements in iron smelting, without confining himself to your correspondent's quotation of the previous week, and he now complains of my letter of June 10, as one of over zealous intervention. The legendary Irishman trailing his coat in the road, in his eagerness for a row, would have been as fully justified in whining because a toe had been set upon it.

The indignation of "No. 1 Ironmaster" on behalf of the patentee might well have been spared. My letter contained no taunt against Mr. Ferrie, nor was there one word denying, either directly or by implication, merit to his arrangements. I only pointed out the desirability of disassociating the advantages arising from Mr. Ferrie's retorts from those due to other arrangements of the new furnace. In his zeal (so great that he does not hesitate to foul his own nest), "No. 1 Ironmaster" ignoes all that has been done by smelters out of Scotland, and forgets that, at least, in raising his furnace Mr. Ferrie has followed a successful lead.

In his first letter "No. 1 Ironmaster" said no economy of fuel had resulted from increased height in Scotland; the high furnaces do not work satisfactorily, and their number had remained stationary for twenty years. Opportunities must have arisen in twenty years to reduce the height of these furnaces, and my conclusion that the adherence of the Gartsherrie Company to these furnaces indicated their faith in them can hardly be considered a forced one. He now confesses that his assertion as to want of economy was a pure assumption, on which he has even now no data. The low furnaces recently erected at Gartsherrie must be read as *one* furnace re-built, and its position rather than the question of economy led to its height not being altered. "No. 1 Ironmaster" now finds unfairness in singling out Gartsherrie furnaces for illustration. He himself advanced them, when it suited his purpose, for the very good reason that these alone in Scotland are high furnaces.

In his first letter, "No. 1 Ironmaster" asserted that the four columns of the Ferrie furnace removed the greater pressure in a one-chamber high furnace. He now retreats from this position with the flying shot of the insignificant reduction of volume by the cross walls, and goes in for a new argument—greater regularity of descent. The greater regularity assumption is even less plausible than the reduced pressure one, and its absurdity may be easily proved experimentally. The narrower the column the greater is the influence of the walls in producing irregularity in the descent of the materials.

On the question of the relative value of coal and coke as fuel, "No. 1 Ironmaster" must not take raw coal in the blast-furnace as only equivalent to the quantity of coke it yields in ordinary coking, which differs immensely with the method adopted, and the skill with which the operation is conducted. Coking in any blast-furnace is in its condition the same as in a retort, and here ordinary Scotch coal will give quite 65 per cent. of coke—the quantity given by Mr. Bell on Mr. Hunter's authority. Then, according to Cocker, 35 cwts. of coal is equivalent to 22¾ cwts. of coke, and the Ferrie furnace has reached with 56 per cent. ores the point of economy that has years ago been reached by Cleveland smelters with 40 per cent. ores. Dr. Richardson's figures are beside the question—Scotch coal can be used raw, while Newcastle coal cannot. It is not true that English smelters cannot smelt with 18 cwts. of coke. It is done every day, and my last letter gave particulars. It is true, notwithstanding "No. 1 Ironmaster's" denial, that less than 20 cwts. of coke is enough at Ferry Hill in the higher furnaces. Referring "No. 1 Ironmaster" to Mr. Bell, he will find that gentleman stating that for 1 ton of pig 20¼ cwts. of coke is used in the 80-ft. furnaces there, 17 cwts. in the 103-ft. furnaces, His quotations from Mr. Bell and Mr. Williams bear in no way on the point. The former argues that greater economy need not be looked for by increasing the size beyond that of the larger Cleveland furnaces; the latter, that largely increasing width of bosh does not give greater economy. The Ferrie furnace even now has not reached 15,000 cubic feet, and the arguments quoted are on increasing the capacity of the furnace beyond that. My statement was plain enough in regard to Ferry Hill, and bore on coke used with richer ores than those of Cleveland. "No. 1 Ironmaster" will, perhaps, admit that less coke is required to make 1 ton pig from rich than from poor ores, although he ignores this point, and misunderstands my argument.

The fanciful description of "No. 1 Ironmaster" of the working of an 83-ft. furnace, was of no value for or against the Ferrie furnace, and his assumption that its gases would be incombustible, or, indeed, that they could differ greatly from those from the Ferrie furnace, was absurd. What I said on this point was clear enough, when taken in conjunction with his paragraph, and this being so, the pedantry that seeks to gain a point on mere wording is surely out of place in the Journal.

I have now gone over everything in "No. 1 Ironmaster's" letter bearing on the Ferrie furnace, for although he opens his next paragraph with the words "my opinion of the Ferrie furnace is," there is not one word further of this furnace. And now I beg to return to one or two of his earlier paragraphs. My notice of the extravagances of certain articles in the two leading Scotch newspapers—not the "local press" only—has kindled the wrath of "No. 1 Ironmaster." I agree with him that there is no connection between a practical ironmaster and a penny-a-liner, and I hinted at none, but between the latter and the writer of the letters signed "No. 1 Ironmaster" there may be more than a connection, and, to say the least the cap appears to have fitted. So many of "No. 1 Ironmasters'" facts (?), arguments, and assumptions are identical with those prominently brought forward in the articles in question, that I fear—if there is not a closer connection—the writers have been indebted to the good offices of the same "coach."

In conclusion, I will do nothing more than refer to "No. 1 Ironmaster's" strictures on my remarks as to the natural advantages of Scotland as an iron-smelting country. I spoke plainly enough of the increasing scarcity of ironstones in Scotland, but her rich ironstones and good smelting coals are far from being yet exhausted, and it is simply nonsense of this writer to talk of rich mineral deposits being "freaks rather than gifts of fortune." It is true he did not refer to this subject, but that is no reason why I should not. The rich ironstones of Scotland were not irrelevant to the subject he opened—quantity of fuel required in smelting, and the abundance of her minerals was not irrelevant to the subject of iron smelting in Scotland. SMELTER.

## IRON MANUFACTURE.

SIR,—If any of your scientific correspondents engaged in the iron manufacture can give the comparative advantages and results, in practice, of applying boilers to the puddling furnaces, and of raising the steam in separate boilers for the driving engines, he will confer a favour upon many other of your readers besides

*June* 29. A PUDDLER.

## MECHANICAL PUDDLING.

SIR,—As I observe that a rotary mechanical puddler has been at work for something like three years at the Cincinnati Railway Ironworks, and seems to have gone on satisfactorily, I should much like to know whose machine they have in use, and why it is not used in this country. It is stated that a small furnace will puddle from 2 to 3 cwts. per heat, but as the dimensions are not given we have no means of knowing what were the writer's idea of small. It is admitted that improvements have been introduced since the first experiments with the mechanical puddlers, but as it is said that the puddling at the works is now performed exclusively with them, and that they now make puddle-balls of 5 cwts. to ½ ton weight, I should think it may be concluded that something like perfection has been arrived at. The furnace produces the balls all ready for shingling, makes iron or steel as the demand may require, and is adapted for any description of puddling-mill. The yield is from eight to ten heats per day of ten hours and a half, as much again has been obtained when the furnace has been charged with melted metal. The amount of skilled labour required is very small, one competent puddler being able to attend to several furnaces with the aid of one underhand to each furnace, and a labourer to every two or three furnaces.

Having noticed the difficulties encountered in this country in getting the rotary puddlers to turn out even moderate iron, I have endeavoured to learn what important change has been effected on the other side of the Atlantic. This, I suppose, must be in the fettling used, for it seems that they arrange to have a fettling that, in being burnt out, shall act as an improver of the iron. This system is very good if it is not abused, but it is liable to give rise to false notions as to the economy of a process. It is stated, for example, that the yield of good sound bar is increased by 11½ per cent., but if the fettling employed be such that this 11½ per cent. increase be obtained therefrom, there may really be no real economy at all, and the saving of 40 per cent. of coal, 40 per cent. of labour, and a large percentage of the raw material, may be merely imaginary. If mechanical puddling be really in successful use in America, it should be at once known in this country, for with the constantly increasing difficulty of getting work properly and economically done, when relying solely upon manual labour, it is essential that labour-saving machines should be introduced wherever practicable.—*July* 3. C. S.

## IMPORTANT PATENT OFFICE REFORM.

SIR,—As it is of the utmost importance to all progressive manufacturers to be able to refer, without delay, to the latest completed patents, I make no apology in asking you to lay before your readers the following reply from Her Majesty's Commissioners of Patents to the memorial of patentees, manufacturers, and other asking an earlier publication of the abridgments, and of the "persons" and "subjects" indexes, heretofore always from six to eighteen months behind.

*Pendleton Alum Works, Manchester.* PETER SPENCE.

SIR,—Your letter of May 12, and accompanying memorial, were considered by the Commissioners of Patents at their meeting on the 29th ult., and I have now the pleasure to acquaint you that they decided to comply with the wishes of the memorialists. The abridgments furnished by the applicants for Letters Patent will, therefore, be published weekly, with indexes of persons and subjects, commencing on Friday, July 15, with the abridgments delivered between Jan. 1 and 7, and of which the six-months term would expire between July 1 and 7. Would you be so good as to communicate this information to the gentlemen who signed the memorial. B. WOODCROFT,

*Patent Office, July* 5. Clerk to the Commissioners of Patents.

## THE ROYAL CORNWALL POLYTECHNIC SOCIETY.

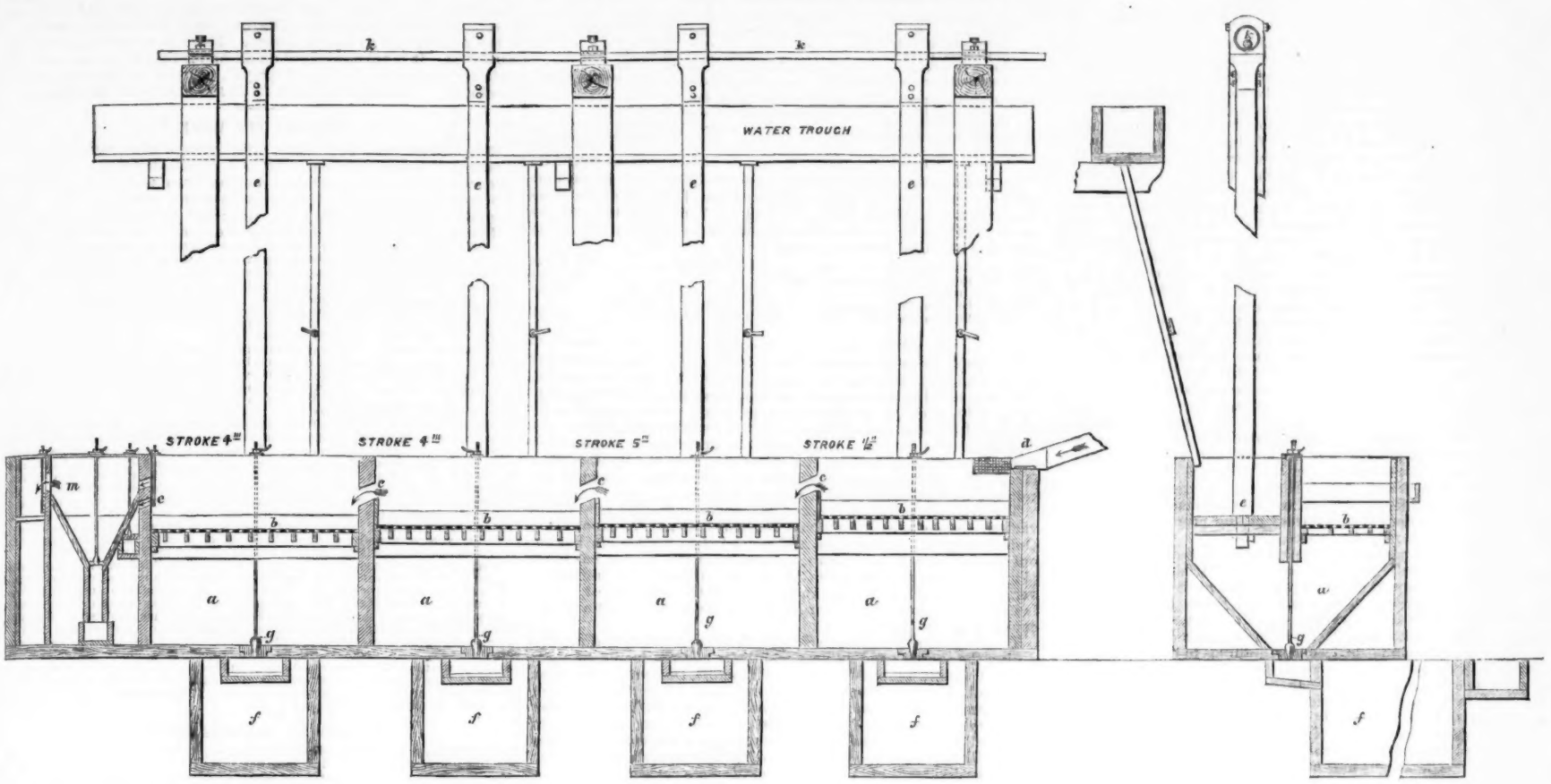
SIR,—The Royal Cornwall Polytechnic Society has nearly attained its fourth decade of useful career, and, independent of its popularity as the Polytechnic Society *par excellence* of all England, has fulfilled in a very encouraging degree the anticipations entertained by its founders, both by the promotion of provincial and general talent, and by rendering in the various departments of art and science most material encouragement towards the development and success of inventions and improvements connected with, and vitally bearing on, the staple interests of Cornwall as a mineral county.

Although the society has been supported by general subscriptions, and is also graciously patronised by Her Majesty the Queen, and by His Royal Highness the Heir Apparent (as Duke of Cornwall), yet it has been a subject of deep regret to the committee of management that the mines of the county, as a most important interest, and so especially identified with the success of the institution, have not contributed to its usefulnesss and prosperity to any marked extent, the subscriptions being at present confined to eight mines—Dolcoath, Tincroft, Polberro, South Frances, East Pool, Trumpet Consols, East Lovell, and Wheal Friendship—who contribute from 1*l.* 1s. to 5*l.* each annually. The published reports of the society will show in a marked degree the great improvements which have been fostered and matured by its annual exhibitions and prizes—such as the man-engine, many valuable modifications of boilers and steam-engines, various dressing appliances, blasting agents, boring machinery, &c.

Whatever success, within its limited power, has hitherto attended the efforts of the society, it is patent that if it possessed a larger resource in funds a wider sphere of operation, with its corresponding benefits, would present itself, and result in the general interest of science, whilst the primal object of its foundation would be more fully developed and attained. With this conviction it has been decided by a resolution of the executive to make a direct appeal to the mining interest of the county, and, as large subscriptions are not necessarily required, it has been thought that, whilst an annual contribution of a few pounds from each mine would not be felt by any adventure, it would give an increased impetus to the society's movements, and enable it, by a more generous distribution of prizes and medals and money, to awaken latent genius, and so enlarge the sphere of polytechnic knowledge and usefulness in all departments.

The undersigned, being appointed a sub-committee for the purpose of communicating with the various mines, beg to bring the foregoing

# ORE DRESSING.




appeal under the favourable consideration of all pursers, committees, and adventurers, and they will be gratified to learn that the mine whereof you are the managing agent, in view of the plea set forth, will consent to contribute an annual subscription to the society's funds, assuring you it will be greatly appreciated and gratefully acknowledged.

ROBT. R. BROAD, Ex Vice-President of the Society.
J. H. COLLINS, Secretary of the Society.

*Polytechnic Hall, Falmouth.*

## ORE DRESSING—No. IX.

SIR,—Up to a comparatively recent date only the coarse grains of ore—say, from 1 to ⅛ inch in diameter—had been concentrated by means of jigging. In endeavouring, however, to make self-acting jigs on the Hartz system—that is, jigging the ore on a bed previously laid of coarse stuff—it was found that though they would work very well for fine stuff, still the work became very inefficient when coarser grains are used. This led to trials with finer grains than it had till then been considered possible to jig, which resulted in a perfect success. Experiments were then at once systematically carried on at Zellerthal to find out the best construction of jig for fine ores, which resulted in producing the present "Sand Jig," of which the subjoined sketches will show the ordinary construction. It consists, as will be seen, of a long tank, or box, divided into four water-tight compartments, *a, a, a, a*, each compartment forming a complete jig of itself, and having no communication with the next compartment, except through the discharge aperture, *c*. The screen in each box is placed 1 in. lower than in the preceding one: *g, g, g, g* are valves, which regulate the discharge of finished stuff into the hutches, *f, f, f, f*, placed below. The plunger rode, *e, e, e, e*, are all suspended from the same shaft, *K*, and the stroke of all four is simultaneous, though the length of stroke is different in each box.—[The sketches to which reference is made are at the top of this page.]

The arragement of settling boxes, or spitzkasten, *m*, at the ends of the jig is necessary, where the slimes are rich enough to make it worth while saving them, as with silver-lead, for instance. Where baser ores are being treated this arrangement may be done away with, and the end discharge, *c*, be made similar to the preceding ones. The mode of operation is as follows:—A bed of coarse and heavy material, about 2½ in. deep, is first laid on the screens; the ore, being previously well disintegrated in water, is fed in a continuous stream through the trough, *d*, on to the first screen *b*. The heaviest stuff at once commences to fall through the beds and screen into the box, *a*, below, while the finer and lighter passes on to the second screen, where the same operation again takes place, and so on through the whole four. The number of boxes depends a great deal upon the quality of the ores to be jigged. In cases where only one mineral is present with the gangue, two boxes will be found quite sufficient. As I have mentioned above, the stroke of the plunger is lessened in each successive box, in proportion as the ore becomes lighter. A great difficulty was encountered at first in the endeavours to run these jigs by the same cam, or slide motion, as in the single jig, or those continuous jigs already in use at Mr. Geyer's works on the Lahn, by which a difference in speed between the up and down stroke was obtained. In doing so it was invariably found that with a speed of from 80 to 90 strokes per minute nearly the whole mass would pass through the first screen, without any separation; at a speed of 100 strokes a certain amount of separation began, and as a greater speed could not well be obtained with these motions without a great amount of wear and tear, recourse was had to an ordinary eccentric motion, and with perfect success.

It had been already noticed that no perceptible difference between the up and down stroke of the plunger was obtained when using such a short stroke as ¼ in. at a speed of 100 revolutions per minute, and, therefore, it was rightly argued that the adoption of a uniform motion could not be any impediment to successful working. On the introduction of the eccentric a speed of 150 revolutions per minute was obtained, and found to be about the requisite speed for the finest ores then in use, the size of grains varying from 0·007 to 0·002 metres. The eccentrics for these jigs should be so constructed as to allow the stroke to be changed at will, as it is necessary to alter this for each different size of ore which is treated. The utmost limit in the working of fine stuff by jigs has, I believe, been attained by a machine similar in general construction to the above sketch, erected experimentally at the works of the Lehigh Zinc Company, at Bethlehem, Pennsylvania. The stuff which it was requisite to concentrate was the refuse of the other washeries, which had been deposited in the slime ponds, and consisted of an extremely fine sand, mixed with a dense, hard clay, and containing on an average about 10 to 11 per cent. of zinc. In order to make this profitable for the manufacture of the oxide of zinc, it had been necessary to pass it through the buddles twice, and then again through the old Cornish dolly-tub. By these three manipulations the percentage of zinc was raised to 18 and 20 per cent. On introducing this jig, it was found that the same stuff could be concentrated to 20 and 22 per cent. zinc in the one operation. For this stuff it was found advisable to diminish the length of stroke of the first plunger to 5-16 in., and the other three to ¼ in. The speed was from 163 to 170 strokes per minute. These sand jigs work most satisfactorily, so long as care is taken that the ore is perfectly disintegrated in water before being admitted to the screen, and the feed must be maintained with the utmost regularity. The amount of stuff one of these jigs will put through is, with grains of 2 millimetres, about 10 cubic metres a day, consuming from 280 to 320 litres of water.

These machines have now almost entirely superseded buddles and shaking-tables in most of the German dressing floors, and their introduction has tended to greatly simplify the whole mechanical preparation of ores, both from the large amount of work they accomplish, at scarcely any expense for manual labour, and the much more perfect concentration which they accomplish. These three jigs that I have attempted to describe may, I think, be taken as types of nearly all the other jigs which are constantly being patented, each one of which claims to be better than its neighbour. The construction may vary slightly, but the principle, of course, remains. Some inventors still hold on to the elastic diaphragms instead of plungers, as in the Petherick, Trumball, and Morton jigs; others, again, have a combination of scrapers, to assist the water in removing the tailings, as in Huet and Geyler's patent, exhibited at the Paris Exposition of 1867. Nearly all these inventions have some good points about them, but I have not yet even seen any one of them do better than those I have described, while they mostly have the disadvantage of costing about double what these do, and also require a much greater power to drive them. The cost of a second jig, similar to sketch, would in Germany be about 150 thalers, or 22*l.* 10*s.* In America the cost is about $230, or 46*l.*

*New York, June 6.* E. G. SPILSBURY.

## BORING MACHINES IN METALLIC MINES.

SIR,—My attention has been called to a letter in the Supplement to the Journal of June 17, upon the subject of Boring Machines in Metallic Mines, in which it is stated that the introduction of boring machines into metallic mines has hitherto been a failure. I beg leave to dispute this dictum. About 18 months ago I adopted Haupt's improved borer, as manufactured by Messrs. McKean and Co., of 5, Rue Scribe, Paris, and it has not been a failure, but quite the reverse. In the cost of drivage the saving has been about a third, and the saving of time about the same. The stone until lately has been intensely hard, as hard, if not harder, than whinstone, so the machine has had a good trial, and for the last 12 months we have not had a break-down of any importance. The motive power is *compressed air*, driven by a large water-wheel. The ventilation, in consequence, is perfect. The level forehead is about 260 fms. from "grass," and the level could be continued, if necessary, for miles without any appliances in the shape of air shafts for ventilation. As the level has to go about 500 fathoms further it is not likely to be completed for some years. It might, therefore, be worth some of your readers' while to come and see it at work. Boring machines will not, however, in our day, be used in "every hole and corner of mines," as Mr. Rickard says. The outlay for machinery, &c., is too heavy, and water-power is an absolute necessity, as the only power sufficiently economical to make driving by machinery pay, and then only in cases where there are long adits to drive.

GEORGE WM. DENYS, Bart.

*Draycott Hall, Richmond, Yorkshire, July 5.*

## IMPROVEMENTS IN STAMPING MACHINERY.

SIR,—I have been reading with a great deal of interest several articles in your valuable Journal respecting improvements in stamping machinery, and as a practical engineer of many years' experience I believe there is no branch of engineering that stands more in need of improvement than that class of work. To lift a heavy weight all on one side appears to me a most ill-contrived thing, and I felt a desire to see how Mr. Walker got over the difficulty. Accordingly I went to his premises, in the neighbourhood of Finsbury-square (about 10 minutes walk from the City), when I had the satisfaction of seeing one of his improved machines in operation, and I could not but feel surprised that the inventor himself, who had been making stamping machinery for 20 years, should not before this have hit upon such a simple, though vast, improvement on the old plan; but, according to the old story, one may think anybody might have done it now that it is actually seen to be done.

In this case, as in many others, one improvement begets others; for instance, where heavy stamps are used the ease with which a man can turn them by hand a quarter or half round in a moment when the machine is at work is valuable, as it keeps the face of the stamp-head always flat, doing the work not only quicker but far better, with very little wear and tear except from fair work. It has also enabled the inventor to introduce a new bed for the stamps to fall upon, for either wet or dry stamping, which is of importance where there is a scarcity of water or none.

I watched the working of the whole thing with great care, and my conviction is simply this, that when the improvements are better known stamps will not longer be erected on the old plan, and what are termed atmospheric stamps will also in a great measure be set aside as altogether unsuitable for such rough work. The only difficulty I see is the opposition that they are sure to meet with in the mining districts till they are fairly at work, and prove to a demonstration their superiority, when they will be certain to make their own way. I have no interest in mining or mining machinery, but it gives an engineer pleasure to see such a rough machine brought to perfection, and to bear testimony to its efficiency. D. B. S.

## THE JUDICIOUS WORKING OF METALLIC MINES.

SIR,—At the present moment it may not be amiss to point out that one great reason, and one which should never be lost sight of, why there are so many unprofitable metallic mines is owing to preventible causes. When we look at the immense unworked area in Great Britain and Ireland, capable of supplying the wants of the civilised world for generations to come, it is matter for regret that in the working of our metal mines there are so many hindrances to that profitable development which is at once the best attraction for capital and means of employment to our working population.

It cannot but be admitted that the Limited Liability Act, carried out in the spirit conceived by the Legislature, contains in its provisions the germ of many principles that allow of an immense impetus to industry. It is peculiarly adapted to mining adventure, which from its comparatively little known character to the general public has undoubtedly, by its limitation of responsibility, introduced a large new body of capitalists in the working of our mines. In comparison to the whole investing class these, however, are few compared to what they ought, would, and will be, were they managed on a rational system. I at once take the high ground, that the majority of British metallic mines, legitimately worked, will pay. To define the various causes that militate against the prosperity of mining would be a large subject, and one that could not be fairly treated in this short letter; I would, therefore, rather confine myself here to a few remarks illustrative of the position I have assumed as to the inherent profitableness of metallic mining, intelligently gone about. To take them in inverse order—for, except in very exceptional cases, the one must precede and accompany the other—let us assume that suitable capital has been provided to work a sett in any of our well-known metallic districts. If a new mine, the experience of surrounding mines—or, if an abandoned mine, the examination of old workings—will be a very good guide to the successful prosecution of the adventure, as not only can the good results of experience be followed, but the mistakes that have led to loss, or, possibly, complete failure, avoided. The indifferent, or, perhaps, conceited notion that the peculiarities of any district can be safely neglected is a most fabulous idea. There, indeed, seems to be a feeling extant that the miner can decide independently of local characteristics; and with some the desire to pander to this erroneous idea, and so seem to attain ideal perfection, may be at the root of much of the presumption that is so fruitful of error and loss. Local teaching must and will be sought by the most proficient mining engineers. Their vocation is more to interpret than to tell the details of the matter to be solved; furnished with these, the skill of the engineer is shown in the generalisations he arrives at, forming the bases of the procedure he recommends to best develope the property under consideration.

The capital and a well-considered plan of working arrived at, it remains only that it be carried out skilfully generally to ensure success. Much depends on the local management to do this efficiently, more than in anything else: the mine agent must provide for unforseen circumstances, that compel him to modify or depart from the strict letter of his instructions. Sound judgment and perfect knowledge of the whole situation is needed to meet those exigencies which in a large mine are constantly recurring, and call for prompt action. Above all, there should be liberal and competent use of the dial: we may as well imagine a ship on the ocean pursuing its course correctly without a compass, as look for correct working where there is inability to dial and map. Yet it is a fact that much time and money has been and is being lost in our mines through lack of this most essential requirement. The slow and expensive nature of the work in metallic mines demands that every foot excavated should be well considered and planned prior to executing the work, to ensure its utility. Many extensively worked old mines on being re-opened have yielded quite a harvest of unexpected produce from imperfect former working, and been the key to unlock greater treasures in whole ground underneath. No doubt in the best managed mines there will be here and there overlooked deposits of ore, but we may conclude that in proportion to the efficiency of the management so will be the perfection of the results attained. The profitable re-working of not a few mines ostensibly knacked on account of their poverty, or condemned because a supposed perfect prior management failed to realise successful results, is by no means rare.

The hollowness of testing a mine or district by any standard of this or like kind has been demonstrated over and over again, as it will be often hereafter. With what incredulity would many have listened if when the major part of the Shropshire lead mines were lying dormant, and to be had for the asking only very lately, it had been predicted that now the district would rank foremost for rich and valuable mines. This transformation is not peculiar to or confined to any district. I need not go so far from home when I can point to one of our own district mines trebling its former output these last six months, to the benefit alike of shareholders and workpeople, and by no means a solitary example of the resources of the district. Like the Shropshire mines, the testimony of past profitable working is too well authenticated to be lightly regarded; and a like elasticity and future successful working await other good

mines here, which only need a like vigorous development to add another to the list of rich British metallic districts.

*Caldbeck, Cumberland, July 5.* CUMBRIAN.

## PERSEVERANCE AND SUCCESS IN MINING ADVENTURE.

In no pursuit is perseverance combined with success more closely than with the mining interests of this country. One of the most useful results of knowledge that man can attain is the appreciation of his individual powers, with the corollary of perseverance to sustain them. It is of no use to endeavour to grow corn on rocks, nor to dig for minerals in sand, or districts barren of ores in paying quantities. Yet many men continue, in spite of failure again and again, the effort to acquire that which practical experience should have told them at first it was impossible to obtain. Perseverance, however, when practically applied, is the harbinger of success. As an example, let us take Kitty (St. Agnes), Tincroft, and Carn Brea. What were these mines when Capt. Teague took the management? Kitty was a negative, if not a losing concern; but the magic perseverance and practical skill of the gentleman named soon developed its resources, and the property at once became remunerative and prosperous. Tincroft for years was all but a valueless undertaking—the mineral existed, but vitality and perseverance were lacking in the management. Shares were all but unsalable at 3*l.*; the price is now 52*l.* 10s. per 6000th share, and the company is dividing 36,000*l.* annually in dividends. Earnest perseverance and practical skill succeeded. In fact the manager looked difficulties in the face, and when once he had undertaken to revigorate the concern, no matter how great the odds, he achieved his object, and possesses for himself and co-partners the best tin mine in Cornwall. Again, he embarks in the Carn Brea Mine, takes the management, and a lumbering, overcharged, dormant mine becomes an active and vigorous property. The market value quadrupled under the influence of his wand—the public awake from their lethargy, for action is apparent, the spirit of perseverance and life is at work, confidence is engendered, whilst effective skill developes the resources of the property, and immediate gains to the shareholders ensue.

We are led to the above remarks in the hope that other dormant properties in Cornwall may yet become revivified, and the shareholders reap some benefit for their protracted perseverance and outlay. Is it not practicable to render Seton, North Roskear, St. Ives Consols, Camborne Vean, Fowey Consols, Margaret, and North Crofty equally profitable with East Pool, or even Phœnix? Practical skill and action have accomplished wonderful things in both of the latter mines. Why should not economical, though efficient, expenditure and earnest perseverance render each of the above "mines of wealth?" Tin is high in price, and the miner ought to exert every energy to realise early and the best results.

Again, Dolcoath and Cook's Kitchen are monuments of the practical skill and perseverance of the late Capt. Charles Thomas; why should not the Old Tolgus and other mines now idle be re-worked? Harmony and Montague, abandoned for copper, have proved wonderfully rich for tin under the management of Capt. Stephens, controlled by the supervision of Mr. Spargo, of Gresham House, and is likely to develope itself into a great and prosperous property. The quantity of tin left standing in the old workings is beyond calculation. At West Jewell success likewise attends the re-opening of an old abandoned copper mine. The tin is exceeding rich, and the quantity at present, though unascertained, is proved to be considerable, and daily discoveries have been made of rich and paying deposits.

The spirit of mining should eat itself out of the obstructive "customs of the county," the "envelope" of prejudices and merchant influences should give place to active energy and skilful perseverance; then mining, as the chrysalis from which arises the winged and perfected butterfly, will emerge into success, fairly and profitably accomplished.

R. TREDINNICK,
*Crown-court, Threadneedle-street.* Consulting Mining Engineer.

## FINANCE, AND THE MINING INTERESTS.

SIR,—What is finance? France gives us a practical example in raising 80,000,000*l.* sterling in one loan, the most gigantic ever successfully launched in modern history, subscribed for with alacrity, and realised without any apparent effort or even strain upon the resources of the country. France will, however, do well to remember that this loan goes to the invader, and that the amount is lost to the nation for ever. This loan is the first of a series that must follow, and happy will it prove to "la Belle" if her institutions, trade, and commerce do not severely feel the withdrawal from circulation at home of this and the vast other sums that must follow before the wounds and indebtedness incurred are healed and absorbed. It is not too much to predict that each payment to the foreigner will add to the tension at home. It is true that the extravagance and expenditure of the empire were grave and prodigal, but then the money remained in the country. Paris is largely re-built, sanitary reforms effected, railways, docks, and shipping extended, and many improvements of a domestic character carried out, that add greatly to the wealth of the nation. The money remained at home, for the circulation of the "bulk" was simply from hand to hand, whilst France was possessed of additional arsenals, docks, ships, and palaces, due mainly to the expenditure of the Imperial *regime*.

The money is now handed to the Prussian, and before his troops pass the Rhine unhappy France will have disposed of her ready money without receiving an equivalent. Additional taxes will have been imposed, with restricted means to pay, whilst the national debt will have assumed a proportion unknown amongst the nations of the world. England, thou star of hope and promise, shield to the brave and industrious, in what direction and in what country are not they sons thriving, and leading the van to progress and success? In America the sinews of industry were implanted by thy hardy sons. In India civilisation and prosperity attended thy footsteps. Australia and New Zealand are indebted to thy children for the diffusion of practical knowledge, the suppression of savage brutalities, and the opening out of two continents that for metallic yield and agricultural wealth are unsurpassed. Again, Canada, Brazils, Nevada, California, and Mexico are indebted to thee for capital and labour to open out the vast mineral resources which otherwise would have remained undeveloped probably for ages yet to come, whilst in every clime and every country thy power is respected, thy support invited, and its worth acknowledged.

What is the national indebtedness of England? According to the last published accounts it was under 760,000,000*l.*, not one year's income! The wealth of England is so great, its trade and commerce so ramified, extended, and expansive, that only an approximate estimate can be made as regards the future. We have, however, the evidence of Parliament that at present the annual income from agriculture, mining, trade, and commerce exceeds 800,000,000*l.* sterling. What has the last quarter of a century given us in addition?—namely, railways, steam shipping, telegraphs, and cheap postage; again, cheap salt, sugar, tea, coffee, and a number of articles of nutriment and luxury that a quarter of century ago were only obtainable by the wealthy; now, they are in daily use by the artizan, mechanic, miner, and labourer, and even introduced as necessaries in our workhouses and institutions of charity and correction.

At the close of June month the accumulation of business at the Bank usually attains its maximum for the year, although in this instance it is thought otherwise in well-informed monetary circles. The movements for the week ending June 28 were as follows in respect to customers' deposits, and customers' borrowings and discounts. The former was increased by 3,882,434*l.*, and the latter advanced 3,884,876*l.*; in fact, the money was not removed from the coffers of the Bank. Merchants and bankers at the close of the half-year were desirous of increasing temporarily the balances in their favour, hence for short dates large sums were obtained, and which low rates of interest facilitated. There is little doubt that the deposits of customers for the next two or three weeks will greatly diminish. The active note circulation of the Bank was only 24,049,750*l.* on June 28. For the week previously the Bankers' Clearing House passed the large sum of 73,240,000*l.*; the largest sum being for one day (27th) 13,375,000*l.*, equal to 55 per cent. of all the notes in circulation. It is, therefore, evident that had not the "Clearing House" been in existence the whole of the "notes in reserve" now in the tills of the Bank of England, amounting to 16,813,360*l.*, would have been absorbed in the Joint Stock and other banks of London in their daily transactions with their customers. The amount of bullion continues to augment, and the influx will proceed. At the last weekly returns it stood at 26,609,540*l.* The position of the Bank on the 28th ult. was as follows:—

| | | |
|---|---|---|
| CR.—By proprietors' capital | £14,553,000 | |
| Rest | 3,115,749 | |
| Government Securities | 12,991,579 | |
| Customers' ditto | 20,661,763 | |
| Notes in tills | 16,813,360 | |
| Gold and silver coin in tills | 746,430 | £68,881,881 |
| DR.—To public deposits, Exchequer, Savings Bank, National Debt, and dividend accounts | £ 9,898,184 | |
| Customers' deposits | 23,139,721 | |
| Seven days and other bills | 506,478 | 33,544,383 |
| Leaving | | £35,337,498 |

The Bank at the close of the half-year had positively at its command the large sum of 68,881,881*l.*, and was indebted at the same date to Government, its customers, and on Bank post bills, to the extent of 33,554,383*l.* only. The balance in hand amounted to the large sum of 35,337,498*l.*—namely,

| | |
|---|---|
| Proprietors' capital and rest | £17,668,749 |
| Notes unemployed and paid for by bullion | 16,813,360 |
| Gold and silver coin | 746,430 |
| Difference between Government & customers' securities, 33,653,342*l.*, and public and customers' deposits, 33,544,383*l.*, being | 108,959 |
| Total | £35,337,498 |

It is wholly beyond my power to point out the channels adopted by the Bank for investing the proprietors' capital, still we may premise that nothing more hazardous than guaranteed railway debentures, India stocks, and selected foreign bonds would attract the attention of the board of directors, whilst, probably, the greater portion of the sum employed is embarked in Government home securities. In conclusion, nothing can be sounder than the Bank of England. The only regret we entertain is its hoarding instead of circulating its vast wealth and treasures.

The demand for metal is good, and appears to have arisen from various channels, both for home consumption and for exportation. Orders for iron are numerous, and second-class makers are holding out for full prices. An advance generally of 20s. per ton has taken place in copper, and the market is healthy in tone. Tin (refined) is very firm at 136*l.* and 138*l.*, and plates are in great request. Lead is in fair demand; buyers can readily be found at a fractional discount on quoted prices.

The mining interests are decidedly in the ascendant, and promise during the summer and autumn months to engross increased attention. The vast wealth discovered at Tincroft, Dolcoath, Carn Brea, Botallack, Phœnix, Great Vor, and numerous other mines in Cornwall gives a peculiar fascination to tin mining, whilst it is satisfactory to observe the continued and certain progress to success of several progressive concerns that are at present wholly neglected, but which soon will appear on the *tapis* as dividend properties. The last quarterly dividends of Van and Tincroft were respectively 12s. and 30s., and prices of shares stand at 55*l.* and 52*l.* 10s. each. The shares in Van are 15,000, and Tincroft 6000 in number. The market value, therefore, of the former is 825,000*l.*, and of the latter 315,000*l.*, each mine yielding 36,000*l.* annually in dividends. Phœnix has risen again with a hopeful countenance, and we congratulate the shareholders on a dividend of 3500*l.*

South Condurrow and North Crofty appear in the ascendant, whilst the dividends of 2s. 6d. and 1s. 6d. respectively are, to say the least, encouraging. Spearne Moor has given a dividend of 20s., and will continue to pay so long as the price of tin is maintained. Herodsfoot has declared the usual dividend of 30s. for the quarter, whilst West Seton (1000*l.*) was the only copper mine that declared a dividend during the month of June. Cornwall is rich in tin and lead mines, whilst Wales, both North and South, is rich in dividend lead mines, and pregnant with several highly progressive ones. Trannack, West Jewell, South Crofty, East Pool, and West Chiverton ought to be purchased at ruling quotations.

R. TREDINNICK,
Consulting Mining Engineer.

3, *Crown-court, Threadneedle-street, London, July* 1.

## THE MARAZION DISTRICT.

SIR,—For some years past this district has been under a cloud, from the year 1720, when old Wheal Fortune was discovered by a few poor men, one of whom, from the profits realised on his shares, became a baronet, and shares at one period were sold for a pot of beer, and then a pint of brandy, and the cost advanced to 1000*l.* per share, and this baronet had 70 of them. These shares eventually became the foundation of a noble house. From the year 1720 up to 1825 this district stood pre-eminent in the history of Cornwall for the richness of a number of its copper mines in succession. At this period some very rich mines, yielding large returns in tin, were also discovered, but tin in the ore rarely averaged 35*l.* per ton. Wheal Vor for the year 1817, when the first rich bunch of tin was discovered, did not average in price above this figure. Yet the returns of tin ore in 30 years amounted to 3,200,000*l.* sterling. Block tin was selling in 1826 at 68*l.* per ton, but now selling at about 132*l.* The Great Wheal Vor Mines are the up-cropping of the Marazion district, separated by a chain of granite hills, but the tin is found embedded in the slate rock in the centre of two granite hills. Great Work Mine, a little to the north, yielded all its immense treasure in tin for a century at least in the granite rock. The Godolphin Mine, which yielded such an immense deposit of rich copper ore, is at the base or foot of this granite hill, but the ore was found in the slate rock. The Godolphin vein or lode is the same vein or lode as the Old Fortune lode, situate about two miles north-east of the ancient town of Marazion, so celebrated in the days of the Phœnecian merchants in their trade with the Cornubians or Ancient Britons of that period.

The great depression in the price of tin and copper paralised Cornish enterprise for some years, coupled with the high rate of royalty or dues (the latter a Cornish terms); but the world requires more tin than formerly, and the advance in the price of this metal has caused Cornwall to rise from utter ruin to a state of prosperity, the sales of copper ore having fallen off in Cornwall from weekly sales to fortnightly ones, and these sales reduced in amount from 40,000*l.* to about from 2000*l.* to 4000*l.* weekly. What has caused this change? a stranger would ask. In the first place, rich mines discovered in new countries of high percentage of metal, and the landowners at home unwilling to meet the competition of the times, hence the calamity. Towns reduced to villages, and villages to mere church towns, as was the case 200 years previously. As railways progress new districts must and will be opened up, and rich mines discovered; the age of discovery will progress, and new districts be developed and found out. Enterprising men succeed each other in every age. Industry is, doubtless, the great secret of cleverness, talent is the soil, education, like manure, is the agent, and enterprise is the capital. In every age liberal men, as a rule, have eventually become the most wealthy. Job was, according to doubtless authority, at one period a poor man, and other Jobs may yet turn up as the world progresses. The earth is inexhaustible, but the want of capital in the hands of industrious men have kept the world back in all ages. If one man succeeds a little more than his neighbour, that man is almost sure to be persecuted. Envy is the great agent of mischief in all ages. But when a man once gets out of the clutches of the world, and he cares for no one, everybody is willing to help him unasked; such is human nature. But to practical business. Prof. White has assayed a sample of copper ore from Wheal Caroline—the Old Jewell lode, about ¾ mile distant from where this ore was broken—which produced upwards of 39 per cent. for copper, so that there is as good fish in the sea as ever came out of it. I firmly believe this ancient seat of industry may yet become as prosperous a district as formerly for the production of copper ore.

A. BENNETT.

## TERRAS TIN MINE.

SIR,—In the Supplement to last week's Journal a letter appears respecting this property, by "A Wonderer." The writer could hardly have used a better *nom de plume*, for he must have been indeed a wonderer not to have seen the error evidently made by the compositors, or his misreading. I think, however, I can detect the cloven foot, and can again see the arrows of calumny. The adventurers need not fear the malevolence that would injure if it knew how. The apparent discrepancies will be fully explained away by the agents, whose reports have been garbled in the quotations. Then "Wonderer" may again have cause for wondering how he could have wondered. I have lately been on the Terras Mine, and for the information of my fellow-shareholders beg to state that the produce of the elvan and the lodes is very good, and improving. The progress of the buildings and machinery is as rapid as can be desired. There is something to really *wonder* at. It is acknowledged on all hands that on mine in Cornwall has greater energy been displayed, or more satisfactory results obtained.

AN ADVENTURER IN TERRAS, AND NO WONDERER.

## TERRAS TIN MINE.

SIR,—I have read with some little interest observations by "A Wonderer" in the Supplement to last week's Journal. His malevolence is obvious; nevertheless that the elvan, as depth is obtained, is becoming wonderfully rich in tin is now a notorious fact. Mr. James, in his report of May 20, says:—"I examined the elvan in different places, and find the deeper the stone is procured the richer it is for tin. Should the yield of tin continue to increase in depth, as it has for the last 12 ft., scarcely any limit can be fixed as to the returns and profits, when the works become fully developed." A box containing over 100 lbs. of this elvan was forwarded to me at the time, and which I tested with great care, and found it to contain over 400 lbs. of black tin to the ton of stone; since which I have received letters from Capt. Rickard stating that the elvan, on the whole, was improving, as the softer portion of the elvans was also becoming richly impregnated with tin, which formerly was bare in tin.

The improvement in the elvan from surface down thus far is a demonstrated fact, and that it will prove throughout its great width to yield 500 lbs. to the cubic fathom at moderate depth, although a wonder, is not impossible. It is a remarkable stanniferous elvan. As to the pure tin spoken of by "A Wonderer," the full paragraph by Mr. James is thus:—"The lode runs transverse from the elvans, and, therefore, forms intersections with them. At these points of intersection very rich deposits of tin ore will be found. In clearing up the excavations made by the 'ancients' in various parts of the sett, the east and west lodes have been found very rich for tin, being in places over 60 per cent. pure tin. These excavations are of great length in the backs of the lodes, and as deep as the ancient workers could sink without the aid of pumping machinery to pump up the water, which in those days could not be obtained, which is evident from the fact that rich courses of tin have been laid open or discovered in clearing the old debris a little below the water level, which is about 20 fms. below surface. In order to further and more fully develope these lodes a 50-in. cylinder pumping-engine is in course of erection, after the completion of which operations will be brought to bear on these rich courses of ore."

Here are, again, demonstrated facts. "A Wonderer," indeed. I have not only tested it myself, but proved that some of the ore from the east and west lodes contains as high as 60 per cent. tin. When on the mine some time since I saw several hundred pounds of this rich tin taken from the lodes to grass. I have now in my office stones of the rich ore from Edwards' and Rickards' lodes. Samples from the lodes, also from the elvan, may be seen at the International Exhibition, Kensington Gore, London, and at Mr. Marsden's stand, the patent stone-crusher. From the demonstrations already made it would be a wonder if the east and west lode in places, especially at the junctions or intersection with each other and the elvans (the intersections are numerous), should not prove to be worth 1000*l.*, or even more, per cubic fathom. The citizens of Troy were noted for minding their own business.

TROY COUSIN.

## MINING IN CARDIGANSHIRE.

SIR,—With your correspondent, "Subscriber," I have read the letters signed "Sampson Trevethan, M.C.E.," but, like him, I have not been led to wonder why Mr. Trevethan depreciates the merits of his own countrymen, seeing that he himself wishes to obtain the fee that might be paid to any other person for inspecting or reporting on those mines. I can vouch for the correctness of "A Subscriber's" statement that Cornish miners are unequalled by any others. Some weeks ago I observed in the Journal that Mr. Trevethan professes to have connection with West Bronfloyd Mine. I wish to inform your readers that his connection with this mine has long since been severed.

JOHN ROBERTS, Manager of West Bronfloyd Mine.

*Pen-y-Groes, near Carnarvon, July* 3.

## MINING IN NEVADA, UNITED STATES.

SIR,—As large investments of English capital have been made in this and adjoining districts, your readers may be interested by a mention of the mines now owned in London, and a general report on the condition of the country. The stage and mail route from the Pacific Railway passes through Mineral Hill, Eureka, and Pinto, to Hamilton, a distance of 120 miles.

At Mineral Hill an extensive and very valuable property has recently been purchased by Messrs. John Taylor and Sons, of London—of this you will hear more shortly. The Eureka Consolidated property (Buckeye and Champion) is in Eureka, and both mines and works are in charge of Prof. Keyes; the net earnings for the present month will exceed 14,000*l.*, with but three furnaces in operation. At Pinto station, seven miles from Eureka, are the Maryland and other mines just purchased by the Pinto Silver Mining Company (Limited). This property embraces some 4500 ft. of mining ground. A careful examination and test of the Maryland ores has been made, and the assay of ores—an average taken from all parts of the mine—gives upwards of 40*l.* silver per ton of 20 cwts. A shaft has been sunk in ore to a depth of 195 feet. Ores in two other mines the property of this company assay from 14*l.* to 20*l.* per ton in silver. All these ores are soft, and easily reduced. The company will immediately erect a mill and furnaces, and employ about 60 men in raising ore and developing the mines. They take possession of the ore on hand, about 100 tons, valued at 30*l.* per ton. Heretofore the product has been sold in San Francisco, or to "custom" mill-owners.

In White Pine district are the Eberhardt and Aurora and the South Aurora mines and mills. Some difficulty has been experienced in working the tramway, which was constructed by the Eberhardt Company, and intended to transport ore for both companies. At present the South Aurora mill is idle, with at least 1500 tons of fair grade ore ready for transportation. The International Mill of the Eberhardt Company, the largest and best mill in the district, is working up to its full capacity—the results you will have officially. I have not as yet visited other properties on Treasure Hill, recently purchased by English capitalists, but shall soon do so. I will note, however, that one claim seeking purchasers in London is not known here at all. The Sheboygan ground is on a line with the main ledge of the hill, and should fulfil the expectations of its owners. I shall examine it, and report to the best of my ability.

The Troy Silver Mining Company (Limited) are operating in Troy district, about 80 miles southerly from White Pine, and parties competent to judge say they have a rich property, but they express surprise and regret at the selection of some of the company's servants.

From all these districts shipments of bullion are rapidly increasing, and prospects are exceedingly bright. The survey for a narrow-gauge railway to connect Hamilton with the Pacific road at Elko has been made, and the project is in the hands of parties who will carry it out without delay: 8000*l.* was collected in tolls on this route last season.—*Hamilton, Nevada, June* 13.

R.

## NEW QUEBRADA.

SIR,—I wish to address, through the Journal, my fellow-shareholders in the New Quebrada Company, as to the very important meeting to be held on the 11th inst. This most unfortunate, and yet, as regards its intrinsic merits, *most valuable*, concern is now on the eve of shipwreck, unless independent men come forward to its rescue. We have a board composed of men of all opinions and classes; they have been chosen and selected from and by ourselves; they hold a large interest in the concern, which they are thoroughly acquainted with, and yet, when they recently presented to us a well-matured plan, with a contractor (Mr. Fell) ready to execute it, they encountered such a violent opposition, proceeding chiefly from a few well-known individuals, that they reluctantly gave way to it. These delays and checks mean the ruin of the company; a strong company can stand them, but to a weak company they are death. I do entreat my fellow-shareholders to use their common sense in this matter, and support the proposals of the board. I have a large stake in the concern, which I have long held, and to have it all thrown to the winds is a serious matter. It is a matter also equally serious to the many new holders of our shares. Those crotchetty, headstrong men, who have been the opponents of every reasonable proposal made by the board, seem never to think of this point, as they ought to do. Now, I ask for a moment's attention. We have two plans more or less before us. One—that connected with Warings, the great contractors—is based on the issue of debentures for (say) 600,000*l.*! Well, they might as well talk of 5,000,000*l.* Only fancy half a million of money from our poor sucked orange! It is simply absurd, and would be certain to sink the company. The debentures *might* survive at *some* value or other, but *we* should be sunk by them irretrievably. It would doubtless end in our being quietly swallowed by the great Warings. The other plan—Mr. Fell's—is to form an independent company, to make a railway from the mines to the sea, and if and when a profit is made of the mines to share that profit with us. If no profit, then we lose nothing. This plan, I should have thought, would at once commend itself to any man of sense. It requires no money from us, and though we give up half the profits we have no calls, and no risk. In fact, it is *the* thing we want, and because it *is* the thing we have a few troublesome men to oppose it. Such men crop up in most places, and they are, alas! too numerous with us. I wish to Heaven they would sell out, and leave us alone. Let them lose their own cash if they like, but I object to their injuring me by their crotchets. Fell's plan of a separate company is the plan for us, and such is the general opinion of the board; but unless we come forward and support the board at the next meeting, on the 11th, it will certainly fall through, and

then we shall grumble and blame the board for our own stupidity. It is now or never, for if the board resign, as they all will if they are not supported, we shall soon be in liquidation. Of this I have no doubt whatever, and our fine property will enrich others than our foolish selves.

I would appeal also to Mr. Consul Hemming and his coadjutators. They are incurring a very serious and heavy responsibility, for if they by their opposition force the board to resign we shall naturally look to them for redress, and if they fail in putting the company on its feet again woe be to them. The ruin of many poor men and poor women will lie at their doors, and ought to lie heavy upon their consciences. I dare say Mr. Hemming is an honest man, but an honest, wrong-headed man is at the bottom of a deal of ruin. One can deal with a wrong-headed rogue, but a wrong-headed honest man is impracticable. All you can do is to shunt him off, and get the line clear. Mr. Hemming has blocked our line for many years; but for him, I believe, we should now be doing well. How happy I should be subscribe a sovereign towards buying his shares at a premium, and putting him on a quiet shelf. I owe him no grudge, and believe him to be honest, but I attribute chiefly to him the present dead lock in our affairs, and I repeat that on the heads of himself and his supporters lies a very heavy responsibility. Better for them to fall than to throw out the board. Success in this would be, indeed, a difficulty for them, which they would then, for the first time perhaps, fully appreciate. But that is their own affair. My affair is to beg my fellow-shareholders to exert themselves at this critical time, to attend the meeting, or send proxies to support their own selected board, or as surely as I write these lines the fate of the New Quebrada is sealed, and its riches will be enjoyed by others, and to us will remain the miserable reflection, when we think of the past in connection with this matter, of "What fools we all were!" I enclose my card. A LARGE HOLDER.

*Liverpool, July 3.*

[For remainder of Original Correspondence see to-day's Journal.]

## PATENT LAW REFORM.

At a meeting of London Patent Agents, held on Tuesday, to consider the proposed changes in the Patent Laws, Mr. GEORGE HASELTINE, M.A., in the chair, the following resolutions were adopted:—

1.—That the chief defects of the patent laws have arisen from a want of appreciation of the natural rights of inventors to the sole use of their inventions, an unreserved recognition of which rights must pervade every equitable patent system, and the true aim of patent legislation is to harmonise these individual rights with the material interests of the State.

2.—That the grant of patents to mere "first importers" is an injustice to inventors, an injury to society, as it induces the "pirating" of inventions, and the reason for these grants no longer existing, legislation should confine the issue of patents to actual inventors and their representatives.

3.—That in view of the benefits inventors confer on the public, and the expenses incident to the completion and introduction of new inventions, a patent for 14 years is an inadequate compensation, and we deem it expedient to grant patents for a term of 21 years without the privilege of extension.

4.—That the patent laws impose penalties upon inventors in the form of excessive fees, which justice and public policy demand should be reduced to the amount requisite to defray the expenses of an efficient administration of a simple patent system, and fees of 10*l.* for the entire term—now 175*l.*—would yield more than sufficient for the purpose.

5.—That the defects of the present practice should be remedied by the adoption of equitable "regulations," and the introduction of the system of granting patents at the risk of the applicants, without any official supervision of the specification or preliminary investigation of the merits of the invention.

6.—That the rights of patentees should be determined by a competent tribunal, excluding all technical objections to the validity of the patent, and we deem it expedient to dispense with jurors and "scientific experts" in patent suits.

7.—That these resolutions, signed by the Chairman, be forwarded to the parliamentary "select committee on letters patent," and such other publicity be given them as he may deem conducive to the success of a liberal measure of patent legislation.

## STEAM-BOILER EXPLOSIONS.

REPORT OF THE SELECT COMMITTEE ON STEAM-BOILER EXPLOSIONS.

1.—A Select Committee was appointed on the same subject on May 16, 1870; they commenced their sittings on June 14, and sat during many days, until July 21, when they reported to the House the evidence which they had taken, and recommended the re-appointment of the committee this session. On March 16 of this year your committee commenced their labours, and concluded the evidence on April 25.

2.—Much evidence has been received which is important and valuable. The witnesses agree mainly as to the causes of boiler explosions, but their recommendations on the subject of prevention are very conflicting.

3.—The attention of your committee has been most pointedly and earnestly called to the existence and working of several voluntary associations, formed with a view of ensuring the periodical inspection of steam-boilers; and your committee have reason to believe that these associations have been useful in preventing explosions.

4.—It has been urged on your committee that a further reduction in the number of explosions might be effected by an extension of the surveys of voluntary associations; but your committee consider that inspection could only be made general by being made compulsory.

5.—Your committee cannot omit to emphasise the fact that steam-boilers are in many instances situated in much frequented parts of towns and cities, under pavements in crowded thoroughfares, in the lower storeys of houses, and in the midst of crowded dwellings.

6.—That these boilers are often faulty in construction, are frequently so placed that inspection without removal is impossible, are without proper gauges and necessary equipments, have exposed safety-valves, whereby the pressure can be increased to a dangerous extent by anyone having access to the boiler, and are too often worked by men who are ignorant of almost everything connected with a steam-boiler beyond the mere act of keeping up a fire.

7.—It is the duty of a steam user to take every step in his power to procure a trustworthy boiler in the first instance; to have it supplied with proper fittings, and to see that it is worked by a competent and sober man, at a safe pressure, and to keep it periodically examined, and always in good repair.

8.—From the evidence given, it appears to your committee that there are in the United Kingdom not less than 100,000 steam-boilers (exclusive of boilers in locomotive engines, steam-ships, and of domestic and hot-house boilers), and that these are not only used in mills and manufactories, but largely in agriculture, and even in the parts of crowded cities.

9.—So far as your committee have been able to ascertain, it appears that the average number of explosions per annum is 50, and that the average number of lives lost from these explosions is 75 per annum, in addition to which a larger number of persons annually sustain injury.

10.—That the majority of explosions arise from negligence, either as regards original construction, inattention of users and their servants, neglect of proper repairs, thoughtlessness in setting, and absence of proper and necessary fittings.

11.—That your committee have not failed to weigh carefully, and to give due consideration to, the suggestions made to them in various forms, that all steam-boilers should by statute be inspected periodically. They are, however, not prepared to recommend the adoption of any system founded upon the theory of compulsory periodical inspection. It appears:—(*a*) That the explosions at present number but 50 per annum, or at most one explosion in 2000 boilers; (*b*) that a great number of these explosions arise from causes independent of and apart from anything that could be prevented by periodical inspection; (*c*) That it is doubtful whether compulsory inspection would not lessen the responsibility of the users, who are best able to ascertain the condition of their boilers, and the competency of the men employed to work them.

12.—It appears to your committee that the Coroner's jury, as at present constituted, cannot, without the assistance of competent and independent professional advice, satisfactorily investigate the causes of steam-boiler explosions.

13.—Your committee, therefore, recommend—(*a*) That it be distinctly laid down by statute that the steam user is responsible for the efficiency of his boilers and machinery, and for employing competent men to work them. (*b*) That, in the event of explosion, the onus of proof of efficiency should rest on the steam user. (*c*) That in order to raise *prima facie* proof, it shall be sufficient to show that the boiler was at the time of the explosion under the management of the owner or user, or his servant; such *prima facie* proof shall only be rebutted by proof that the accident arose from some cause beyond the control of such owner or user; and that it shall be no defence in an action by a servant against such owner or user, being his master, that the damage arose from the negligence of a fellow-servant.

14.—That, whenever an explosion happens to a boiler, whether such explosion is or is not attended with loss of life or injury to person, or damage to property, it shall be the duty of the user to report the same to the Coroner of the district; and the Coroner to whom the accident is reported, or, in failure of such report, on the fact coming to his knowledge, shall hold an enquiry, and apply to the Board of Trade, and the Board of Trade shall thereupon direct one of their competent practical surveyors of boilers, or some other practical person, to assist the Coroner in the investigation.

15.—That the Coroner shall report the result of each investigation to the Secretary of State for the Home Department, and that such reports be annually presented to Parliament.

## THE GREAT MONT CENIS TUNNEL.

The reported occurrence of a terrible accident at the Tunnel—a length of 50 metres having fallen in, burying a large number of the workmen in the ruins—attaches a present importance to this great engineering work, which is practically unknown to the large mass of readers unconnected with engineering. The construction of a tunnel more than nine miles long, where no vertical shafts for light, or air, or refuse was possible, where the work must be begun from each end, where the levels and the angles must be perfect to ensure a meeting, presented a problem which even the boldest engineer might shrink from with alarm. In such a tunnel, however, human labour was too slow to be really useful, steam could scarcely be used in so close a place, three or four miles from the mouth and fresh air. Mr. Medail, of Bardonnèche, 30 years ago, showed that a tunnel from his village to Modane was the shortest line through the Alps; but how was this tunnel to be made? The ordinary process was hopeless, for shafts could not be sunk, as the shortest required would have taken 40 years to cut. No ordinary miner could have bored a hole of 30 in. long for blasting purposes in less than eight hours in some of the materials of the Alps, and hence the progress would have been fearfully slow. M. Maus, however, a Belgian engineer, devised a machine to cut the rock, and this machine was to be worked with springs, to cut the rock into blocks, and so do the work of many men. M. Colladon, of Geneva, struck the key of the position, by suggesting the use of compressed air; but he had not the honour of showing how it was to be used as a motive-power. Mr. Bartleet, an English engineer, having invented an engine for blasting which was worked by steam, M. Sommeiller adapted it so as to be used by compressed air, and thus the means of boring the Mont Cenis Tunnel were secured. Simple as this seems, it was a triumph worthy of the highest genius, and 20 years ago would have seemed quixotic. As Hannibal is said to have crossed the Alps by dissolving the rocks with vinegar, so the Mont Cenis Tunnel may hereafter be said to have been blown through by the breath of man. The use of steam was hopeless in so confined a space, the labour of human hands was equally hopeless in point of time; but with a wonderous adaptation of means to ends the falling waters of the Alpine valleys were imprisoned to compress the air, the air was conducted along vast tubes as the cuttings advanced, and after doing all the hard work for human hands, escaped from its imprisonment, and made existence possible for the very men who made this air a slave! Compared with this great triumph all the achievements of modern engineering sink into the shade. For nearly 15 years the work has progressed, and the tunnel will soon be completed. Two thousand men have been employed, two little towns have arisen at each end, and in the very basis of the Alps, 5000 ft. below the eternal snows, the dull, dead thud of hundreds of chisels, driven by air from the valleys four miles away, have hollowed out recesses for powder to be placed in, and the rock has been removed in hundreds of tons. The rattle of these chisels cutting away at the hard rock exceeds by one-half the raps of a steam locomotive going at 60 miles an hour, and holes are made from 1 to 4 inches in diameter with marvellous rapidity. The chisels dart out with magic force and power, and in a few seconds a huge hole is made, and a tunnel 26 ft. 6 in. wide and 20 ft. high, and its temperature increases from 60° at the mouth to 81° at the workings, where the men work on night and day amid the din of the chisels and the glare of the lamps. From half a yard a day at first the progress increased to more than 10 ft. per day. Each yard of progress costs not less than 200*l.* (or double the average of railway tunneling here), and the total cost (at 224*l.* per yard) is estimated to reach 3,000,000*l.* This is not remarkable, since for every yard advanced 70 cubic yards of rock has to be displaced and removed not less than three miles to the mouth, while 25 cubic yards of masonry have to be built with the materials brought more than 12 miles. One-half of the tunnel was completed in nine years (1866), and the third quarter by the end of 1868, and the completion of the works was promised for February, 1871, but the junction was really effected Dec. 26, 1870, and probably by the same date this year the whole tunnel will be open all through.

However contemplated, the conception and the execution of this vast work surpass all praise. Napoleon (the Great) said "impossible" was no French word: our own Stephenson said that a tunnel through the Alps was only a question of cost, but neither the promoter of the Simplon route nor the architect of the Britannia Bridge could have hoped for so marvellous a triumph or success as the Mont Cenis Tunnel under the Alps has proved.

## THE DOMINION PACIFIC RAILWAY.

For the past year considerable interest has manifested itself throughout the Dominion of Canada to further the construction of an Atlantic and Pacific Railway across British territory. The great benefits a line of this kind would confer upon that country have been so repeatedly urged, both by members of our own Parliament and that of the Dominion, that beyond a reference to the marked success, both in a financial and diplomatic point of view, attending the completion of the Union and Central Pacific Railways, we need say but little in urging the construction of the Dominion Pacific Railway. As most of our readers are aware, the above lines connect the vast network of railways working over the States east of the Missouri river with the Pacific coast. That section from Omaha, on the Missouri, to the Rocky Mountains, being the Union Pacific, and the second link across the mountains the Central Pacific Railway. The territory Nebraska, penetrated by the first line, consists of rolling prairie land, without any timber whatever, and very little high land, and is watered by the River Platte, which, taking an almost direct course, frequently floods the adjoining country, causing great loss and disappointment to the settler. The Central Pacific, after admirably overcoming some engineering difficulties, penetrates the mountains, and opening up the rich mineral districts of Nevada, Colorado, and New Mexico, terminates at San Francisco, whilst the Union Pacific Railway has been offering the emigrant special inducement to settle on its lands, along the Central Pacific towns and settlements have sprung into existence with unprecedented rapidity. Thus a very large portion of European emigration for the last few years flocked to these districts of the United States. Without a reference to the shortcomings of these railways as answering the requirements of the main section of an Atlantic and Pacific Railway, there is an evident want of wisdom on our own part in not observing that these railway companies have been for some time drawing a large class of settlement on to their almost unknown land, and this, too, at a time when we are strenuously supporting emigration to Canada and to our colonies.

The Dominion Pacific Railway, which at the present time appears to us to be a project of national importance, is, as may be inferred, a purely English undertaking. A rival railway, the Northern Pacific, to this, running across the United States upon the very ridge of British America, is projected by American engineers, and now seeks European capital to carry out its construction. The United States Congress recognising at once the value of building this line, has granted 50,000,000 acres, or 10,000 square miles, of the public domain, ranging in continuous sections north and south along its route. It is only reasonable to expect that the value of this gift should be large, especially if the price of the land is enhanced in the same degree by the building of the line as was the case with that owned by the Union Pacific. That is to say, if the land be good; and this is a question which concerns us more than any other in connection with the joint enterprises, as the surveys of the both railways prove the route of the Dominion Pacific far superior to that of the Northern Pacific Railway, and moreover the Canadian lands equally valuable as those bestowed upon the North Pacific. No doubt stimulated by the successful sales of Union Pacific Railway lands, which are situated some hundreds of miles south of the route occupied by the Northern Pacific, it is still hoped by those interested in the scheme that the immediate sale of land Grant Bonds of the Northern Pacific Railway will realise sufficient money to construct the line.

It is to be presumed, therefore, that the United States Government have behaved liberally by giving a private corporation a means of raising money and constructing its work. Should, as is expected, the major portion of the four millions of money for the building of the Northern Pacific Railway be raised here—that we invest in American land situated in the Sioux regions of Minnesota, Dekota, and Wyoming—there is hardly any room to doubt that shortly emigration to those parts will become most fashionable, and promotion of emigration schemes, societies, and co-operative institutions may spring up in our midst, to people the lands of the Northern Pacific Railroad.

## COAL RESOURCES AND COAL MINING IN AMERICA.

Mining of anthracite coal was begun in this country in 1820. The anthracite coal region embraces 470 square miles of land. In 1820, when the mining operations were confined to the single county of Schuylkill, Pennsylvania, there was a population of 20,000 in the suburbs of this coal region, and 865 tons of anthracite coal were mined. Since that time the production has been at the beginning of each decade as follows:—

| Years. | Population. | Tons mined. |
|---|---|---|
| 1830 | 45,000 | 174,734 |
| 1840 | 70,000 | 864,314 |
| 1850 | 130,000 | 3,358,899 |
| 1860 | 220,000 | 8,412,946 |
| 1870 | 350,000 | 15,723,030 |

The amount of anthracite coal yet in the earth is as follows, the area and thickness of the veins being accurately known:—

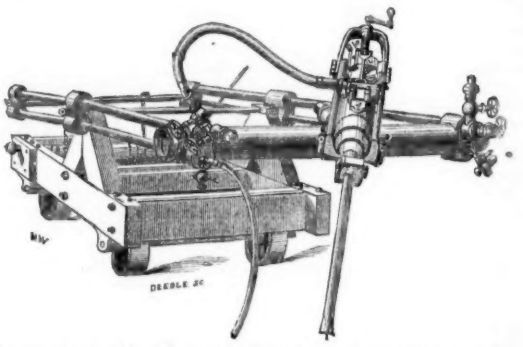
| | Square Miles. | Depth of Coal—Yds. | Tons. |
|---|---|---|---|
| Central coal fields | 126 | 15 | 5,854,961,000 |
| Southern coal fields | 146 | 25 | 11,308,842,000 |
| Northern coal fields | 198 | 15 | 9,179,872,000 |
| Total | 470 | — | 26,343,675,000 |
| Deduct one-half waste in mining | | | 13,171,837,500 |

Leaving of marketable coal 13,171,837,500 tons, or a deposit equal to annual supply of 20,000,000 tons for 600 years.

Statistics of bituminous coal operations show that within a circle of 100 miles, of which Pittsburgh, in the western extremity, is the centre, there is enough bituminous coal in the earth to pay off the national debt of all the governments of the world many times over; and it has been estimated from geological surveys that this coal would pay our national debt 54 times, if its stupendous value could be realised at once.

Far down in the mines (in some instances as much as 1500 ft. below the level of the rivers) there is in the small anthracite region more than 400 miles of railroad, not included in the aggregate of the railways in the State of Pennsylvania. These subterranean railways would, if formed into one continuous line, reach from Boston to Washington, or they would form a double track from Philadelphia to New York and back again.—*Syracuse Journal.*

## MINING BY MACHINERY—THE BURLEIGH DRILL.



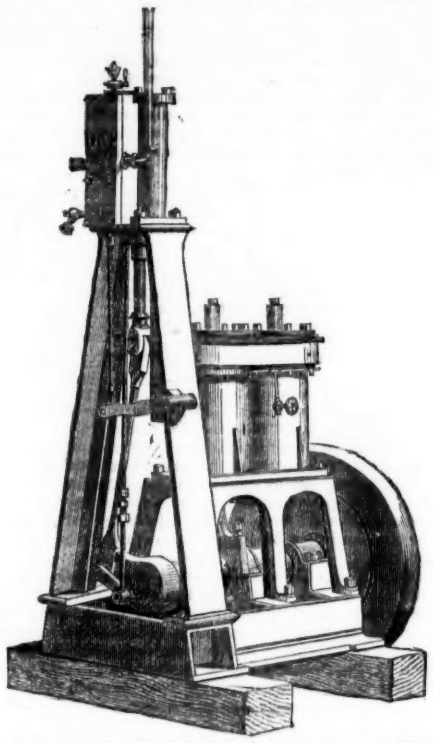
The practical value of a machine to be used in mining operations, as an aid to or substitute for manual labour, can only be judged of after it has been for some time in use, since for the miners and mine adventurers it is not a question of the quantity of work which a machine can perform in an experiment of a few minutes duration, but of the amount of progress which can be made with the assistance of the machine in a course of regular working, extending over a period of some months. The Burleigh Rock Drill is, we believe, the only machine that has been kept practically at work for a sufficient length of time to permit of anything more than an estimate, based upon experimental trials, being published. We were enabled, however, in the *Mining Journal* of June 3, to publish a statement of the work done by a Burleigh drill during one entire year, and as this embraced 225 fathoms of driving in a very hard conglomerate, and upwards of 286 fathoms in coal, the level being in each case 17 feet by 9 feet, and therefore representing the removal of 2170 cubic fathoms of ground in all, neither coal miners nor metalliferous miners can henceforth complain that details of practical working are required. There are but few of our miners who would be discontented if they could drive a level through even kindly ground at the rate of 180 cubic fathoms per month, yet this is no more than has really been done by the Burleigh drill, taking the average of twelve months' working. Even taking the work done in the conglomerate alone, it will be found that 956 cubic fathoms of work was got through in the year, or very nearly 80 cubic fathoms per month, which is by no means an unsatisfactory amount of work.

The performance of this amount of work for only a single year would suffice to remove many mines from the call-making to the dividend-paying list, and would add more to the prosperity of the working miner than could easily be estimated. To suppose that the Burleigh Rock Drill or any other drill could be introduced as a substitute for manual labour is absurd, but what it will do is this—it will enable a shaft to be sunk to the depth of 50 fms. in one-tenth or one-twentieth the time required with manual labour alone, and it will permit of main levels being driven—say, east and west—at every 10 fms. (taking the levels at 1 fm. high and 4 ft. 6 in. wide) at the rate of 100 fms. a month at least, so that in a single year a mine opened from surface might have a shaft down 50 fms., and ten east and west levels 100 fms. long ready to put men into to stope or cross-cut, as may be deemed most desirable for the profitable working of the mine. A mine which now employs 20 men, in one year from starting would then give ample employment for 200 men in the same time; and even assuming the machine by that time to have been worn out, it would already have conferred a lasting benefit on the working miners, and upon the mine adventurers employing them.

That the Burleigh drill will work without repairs does not seem to be hinted at, for during the year in which this enormous amount of work was done the drill was idle one week in three, but as the entire question turns upon the work done in a year the time occupied in making repairs, which are not expensive, is scarcely worth consideration. For some time past the drill has been in use, and giving equally satisfactory results, at Shap, Messrs. Fenning, of Parliament-street, writing that "for at least a month after they received it, it was engaged day by day boring their granite at Shap, which is a hard, tough stone, and since that they have used it to bore 90 ft. of holes in large granite bedstones, which work it effected most readily

and easily, and without in any way injuring itself. They believe the tool to be a most valuable one, and to be an immense saving as compared with hand labour if it can be kept fully and constantly employed." Now, the fact that it must be kept constantly employed, in order to be economic, should suffice to convince the working miners that its adoption in a mine cannot possibly prove disadvantageous to them, and for the same reason its value for sinking shafts and driving main levels must be apparent.

Referring to the work done at the Caprington Colliery, Kilmarnock, where the drill was introduced to enable them to get through a stubborn piece of ground, Mr. H. S. Dunn writes that they "have now got through the rock, and he is happy to say that their progress was very satisfactory." The drills are mounted in various ways, to suit the character of work to be done, but the arrangement shown in the annexed diagram is that which appears best adapted for the purposes mentioned. Fig. 1 is a tunnelling drill, designed for one or two drills. It consists of the bar attached to a long iron frame, connected near its centre by journals and boxes to a wooden frame running upon four iron trolley-wheels. By means of this mechanism the bar holding the drills may be raised and lowered sufficiently to cover the face of a tunnel 6 ft. by 6 ft. It is held in any desired position by a chain at the rear end, and by ruuning out the screws at either end of the bar, until they bear against the rock at each side. It is designed to be run in and out upon a track laid on



the floor of the tunnel. Fig. 2 is the air-compressor used in connection with the drill, and consists of a steam-engine working, by means of a crank shaft, two single-acting air-pumps; it is claimed to be a compactly-built close-working machine, whose lines of motion are all the same, and whose action is such, and the play of the various parts so nicely balanced, that the strain upon them is equalised, counteracted, and brought within itself. By a nice adjustment of the cranks in relation to each other, the greatest power of the engine is applied at the exact point of greatest resistance, so as to produce the best results at the least cost. The air when compressed is taken into a closed chamber, and thence carried to any desired point in pipes in the same manner that steam is carried. Connection between the permanent pipes and drills upon the carriages is made by flexible rubber pipe, which is uncoupled when the carriage is run back for a blast.

The advantage of using compressed air instead of steam for operating a machine of this description is considerable, and that the loss of power, due to the transmission of the air through a pipe, will be judged of from the fact that with six drills running at a heading 7150 ft. (1⅜ mile) from the air-compressors the loss of pressure, as ascertained from a series of 13 careful observations made at different times, averaged less than 2 lbs. (1·923 lbs.) to the square inch. The pressure at the compressors varied from 63 to 67 lbs., and the loss on reaching the heading varied from 1 to 3 lbs. per square inch. As the compressed air escaping after having done its work with the drill is ample to keep the heading well ventilated, the inconvenience that might otherwise arise from driving a long straight heading with the speed already mentioned is entirely avoided, and as the total cost of air-compressor and drill complete would not exceed 300 guineas, there is nothing to prevent many mines availing themselves of it, more especially as, if the machine does the amount of work above recorded, it might be assumed that the machine would last but one year, and that during that time it would cost 1*l.* per day to keep it in repair, and still the machine would cost but 4*s.* 2*d.* per cubic fathom of ground removed. The repairs, however, might safely be put down at a mere fraction of the amount mentioned, for a single machine has drilled 4000 lineal feet of hole without any repairs, and a single borer has proved sufficient to put down a hole 2½ ft. deep. It is reasonable to hope that ere long reference will be found amongst our ordinary mining correspondence to the progress made with machine-boring operations in Cornish or Welsh mines, which can readily be visited by mine agents generally.

CALIFORNIA.—Crocker's new quartz mill is intended for quartz crushing, and, although only a small model, can crush 100 lbs. of rock in ten minutes. It has five stamps, striking two thousand blows per minute. Each stamp weighs 5 lbs., and is 3 in. in diameter. It is the sharp, quick blow that does the work, with very little power in comparison to the old style of stamps. The first cost of the battery is not one-fourth of the old style machines which do the same amount of work. The difference in freight would be very great to many places in the mountains. This battery, which will crush 7 tons per twenty-four hours, weighs about one 1000 lbs., frame-work and all, and can be put on a dray and taken anywhere. It has been patented. A battery of five stamps, twice as large, with 6-in. stamps, would have five times the crushing capacity, or 35 tons per day. The inventor claims that the expense of running this mill will not be one-half of that in ordinary mills. The invention is of purely Californian origin, and at least merits examination on the part of those interested in quartz mining.

COLORADO—THE TERRIBLE MINE.—This mine, the property of the Terrible Lode Mining Company, of England, is one of the best developed lodes in this vicinity, and is a vein that has not failed to pay a good profit on all labour expended in the working of the mine. The mine is situated on Brown Mountain, and in addition to a shaft and four levels has been reached by a tunnel, which cuts the vein at a depth of nearly 300 feet. Since this property has come into the possession of its present owners, one year ago on April 1 last, it has paid a clear profit of over $50,000; and the shares of the company, which are of a par value of 5*l.*, are to-day selling in the London market for 8*l.*, showing that the legitimate profits of the mine have been sufficient to raise the stock to a premium of 60 per cent. The workings of the lode have disclosed two important facts—that the lode increases in richness as depth is gained, and that the percentage of galena also increases with the depth. The ore from the first level of the Terrible Mine yields from 100 to 200 ozs. per ton in silver, the ore from the second level from 200 to 400 ozs. per ton, that from the third level from 400 to 550 ozs. per ton, while the ore from the fourth, or tunnel level, is yielding from 550 to 650 ozs. per ton. There is no doubting these figures; they are absolute, and are derived from the returns of the average value of the shipping ore of the mine. They are instructive, as showing that the ore in a true fissure vein does not decrease in richness as depth is gained, and also as showing that the percentage of galena increases as depth is gained. The mine has already paid two dividends, and it will soon pay another. It is the successful working of such lodes as the Terrible that gives confidence in English markets to our mines, and it is also the careful management of such men as Mr. R. O. Old that enables a good mine to be a constant and steady producer of ore. The Terrible Mine probably never looked better than it does to-day. A wire tramway, extending from the mouth of the tunnel to the base of the mountain, is being erected, which will permit of the cheap and rapid transportation of ore from the mine to dressing and concentrating works to be erected on the grounds of the Terrible Lode Mining Company. The Terrible was one of the first mines in this vicinity to gain a reputation for yielding a large amount of rich ore. The production of mineral from the vein has been constant since the day of its first development, and there is no doubt but that the mine will continue to be one of the best lodes in Colorado.—*Colorado Miner.*

LEAD MINING IN AMERICA.—The Mine La Motte Lead and Mining Company, Missouri, have erected and are about putting into operation the most extensive furnace, crushing and smelting works in the West, embracing all the latest improvements. The old furnace at present in use produces an average of about 180 pigs, or about 12,600 lbs., of metal per day. This production will be multiplied about fourfold upon the completion of the new works. The company employ between 600 and 700 hands, who are paid by the day. Many of the early miners and prospectors, who had worked years on that property, preferring to take their chances where they can lease land, have gone to other mines, and the rapid development of some of the formerly abandoned shafts and diggings is the gratifying result. We know of several instances where miners are making from $20 to $60 per day each.—*Iron Age* (U.S.)

## GOLD MINING IN BRAZIL.

Dr. EMMANUEL LIAIS, the distinguished geologist to the Emperor of Brazil, and who was to have arrived in the imperial suite, but detained by urgent business, is now expected by the coming mail steamer. His presence in this country will be made coincident with two interesting events connected with the Brazilian gold fields. The first is the publication of an exhaustive treatise on the geology and mineral resources of the Brazilian empire. In 1869 Dr. Liais was commissioned by the Brazilian Government to inspect the districts of Minas Geraes, and the slopes of the valley of the Rio de Sao Francisco, with a view to future legislation. The work, now noticed, we believe, for the first time, is based on the personal observation of Dr. Liais during that survey, supplemented by all the official and scientific data at the disposal of the Government, and otherwise available.

The other event is no less important—the public announcement of a new gold mine of extraordinary capabilities in the Minas Geraes district. Discovered by Dr. Liais himself, he has given a very elaborate and highly favourable report on the richness and working facilities of the mine in question. He states that at the outcrop the principal reef is of the unprecedented width of 78¾ ft., prospected for a length of 328 ft. (100 metres). The yield at surface gives 44 grammes per cubic metre, which is about ⅓ oz. to the ton of auriferous stone. The mine consists of one reef, parallel to the general stratification of the ground, and intersected by four disruptive reefs, striking the first diagonally to the strata of micaceous schist composing the rock. This decussation takes place at the head of a deep valley, abutting on the Rio das Velhas, and forms a retaining wall, as if to the drainage of the higher ground of the mountain range, called Los Tres Hermaos; it thus creates a picturesque waterfall of 1000 ft. in height on the course of the Riberao de Santo Antonio. From the crest of the precipice to the level of the Rio das Velho the computed measure of the lode available for adit workings is over 1500 ft., which Dr. Liais observes will afford the greatest facility in getting the stone. He estimates the cost of production at 16·80 frs. per cubic metre, which would make about 5*s.* per ton, taking the specific gravity of the quartz at 2750 kilos per cubic metre. Heatherington, quoting Prof. Rémond and the "Mine Owners' Returns," states the minimum cost of raising in California and Nova Scotia at $1 per ton (say, 4*s.*) Dr. Liais asserts that the auriferous gangue is easily raised and crushed, and that his figure of cost is given from actual data of accounts at several mines of the Minas Geraes districts, worked by adits. The supply of water at the cascade is inexhaustible even in the driest seasons, which is a very notable feature, while the abundance of the auriferous stone will admit of a minimum of cost not hitherto attainable. He lays it down as a rule that the intersection of metalliferous lodes, with the indications of this mine, is an infallible guide for permanence of deposit, and increase of width and richness of the gangue in its progressive depth—a mining canon which practical miners will appreciate as more or less usually observable, by way of a *general* rule we would rather say than "infallible."

## FOREIGN MINING AND METALLURGY.

It begins now to be practicable again to afford information as to the condition of the French iron trade. In the Champagne group merchants' iron, coke-made, is in little demand; on the other hand, some orders are received for special iron. Refining pig has provoked but few transactions. Rolled iron from charcoal-made pig has brought 10*l.* 16*s.* to 11*l.* per ton; and iron from coke-made pig 9*l.* 12*s.* to 9*l.* 16*s.* per ton. Sheets, first-class, have made 10*s.* 16*s.* to 11*l.* 4*s.* per ton, according to quality. Special iron, first-class, has made 9*l.* 12*s.* to 10*l.* per ton. Charcoal-made pig has been dealt in at 4*l.* 16*s.*; and mixed pig, half coke-made, at 3*l.* 16*s.* per ton at the blast-furnaces. The Champagne forgemasters complain bitterly of the treatment to which the Eastern of France Railway Company subjects them, by leaving them without rolling stock; but probably the company has not regained all its old authority in the matter. The works of the Haute-Marne are especially suffering from the want of rolling stock, and it is certainly high time that the goods and mineral train service should be efficiently resumed, as if the production of the Haute-Marne is largely developed, and cannot be disposed of, the district will be in as disastrous a position as during the war. It is suggested that the Eastern of France Company should borrow rolling stock from other companies, rather than not provide an efficient goods train service. The new Marnaval forge, established by M. Roger Houzelot, has been working for a month past; it is devoted to the production of merchants' iron, machine iron, and sheets. There are rumours as to a new blast-furnace being in contemplation near Marnaval, which is intended to produce refining pig. It is—at least, so it is stated—the annexation to Germany of several of the blast-furnaces of the Moselle which has induced M. Desforges to establish the new works. In the Meurthe and the Moselle refining pig has no very clearly defined quotation, as producers, being confident as to an advance, and having regard to the dearness of coke and the limited number of furnaces now producing pig in the East of France, do not wish to make any concession; while, on the other hand, purchasers refuse to enter into this order of ideas. The advices received from the Paris market are still, naturally enough, extremely contradictory. The Fives Lille Company has been paying this month a dividend of 9*s.* 6*d.* per share. The dividend of the Grand'Combe Mines Company has been fixed for 1870 at 2*l.* per share.

The condition of the Belgian iron trade continues good. With the exception of merchants' iron almost all descriptions of iron may be said to be in good demand. Orders for plates flow in, especially from Germany, to which quarter of Europe Belgium has for some time past made considerable deliveries. Prices of iron have hardened, and have even displayed an upward tendency. The North-West Austrian Railway Company has let a contract for 2000 tons of rails to the Thy-le-Château, the Couillet, the Monceau-sur-Sambre, and the Sclessin Works. German forgemasters are stated to have made important purchases of minerals in the Grand Duchy of Luxembourg; this, it is contended by a Charleroi writer, renders the construction of the Athus and Givet Railway more than ever urgent. It does not appear that France intends to impose any import duties upon coal, a result which has been received with satisfaction in the Belgian basins. At present the demand for coal in Belgium on Parisian account has been relatively moderate, and there are still complaints as to want of rolling-stock on the Northern of France Railway. Prices are maintained with firmness in Belgium for almost all descriptions of coal. The Courcelles-Nord Colliery Company will pay on the 15th inst. a dividend of 3*l.* per share for 1870.

At Havre the price of copper has been well maintained of late, standing at about 70*l.* per ton, Paris conditions; Corocoro mineral (pure copper) has made 72*l.*; and refined Chilian and Peruvian, 77*l.* to 80*l.* per ton. At Marseilles, Toka and Spanish have brought 70*l.* per ton; refined Chilian and Peruvian, 74*l.*; and rolled red copper in sheets, 80*l.* per ton. The state of affairs is favourable upon the German markets, upon which transactions are daily acquiring more importance. There is nothing special to report from the Dutch markets. An advance has been noticed at Marseilles in Banca tin, which has risen to 148*l.*, while English has made 152*l.* The German markets are also firmer, and transactions have become more numerous. The Rotterdam tin market has been quiet; Banca has been quoted at 78¼ fls., and Billiton at 77¾ fls.; deliveries have, however, been rather considerable. Soft Spanish lead, first fusion, has been quoted at Havre at 18*l.* 16*s.* to 18*l.* 18*s.* per ton. At Marseilles lead in saumons, first fusion, has realised 17*l.* 12*s.*; ditto, second fusion, 17*l.* 6*s.* per ton; and lead in shot, 20*l.* 8*s.* per ton. Prices have not varied materially upon the Dutch markets. The German zinc markets have shown some improvement; at Breslau zinc has attracted some attention, and transactions have been numerous.

[ADVERTISEMENT.]

WEST RHOSWYDDOL LEAD MINES (LIMITED).

[Extract from the "Liverpool Mining Circular."]

In our last circular we laid before our readers some reports and information respecting this mine, which, as we then stated, is situated in one of the most favourable positions in the kingdom for the profitable production and working of lead ore. We shall recapitulate some of the more important points connected with the situation and prospects of the mine before giving the last and most encouraging report of the inspecting agent; and let us remind our readers that in mining in Wales successes are the rule and failure the exception. In fact, speculating in Welsh lead mines is certain to result in getting about 30 per cent. on the capital invested, although a large portion of the investing public are, by a perversion of facts, led to believe that mining is an unprofitable pursuit, while, as we have often shown, it is far more profitable than any other industry in which money can be laid out. As we have before stated (but a fact like this cannot be stated too often), the situation of the West Rhoswyddol sett is almost unique, and, from the position it occupies as being the focus where the lodes from all the neighbouring mines concentrate, is the subject of a good deal of attention. It is in the same wonderfully rich zone of Silurian rock as Dyliffe and Van, and there is no doubt it will be equally productive of wealth and fortune to those who invest in it.

In his report Capt. Williams, of Great Darren Mine, says—"Since the commencement of this mine we have driven a cross-cut level north about 75 fms., and have cut three magnificent strong, healthy, and highly-mineralised lodes, with well-defined walls, containing fine stones of silver-lead ore. It is impossible to see finer or more promising lodes at such a depth. In the eastern part of the sett we have discovered one of the Great Rhoswyddol lodes, and have sunk 4 or 5 fathoms on it, and I am glad to say the deeper we go the better the lode appears to be. It possesses the same appearances and characteristics as that which, at a similar depth in the adjoining mine, produced 60,000*l.* worth of ore above the 30 fm. level. Here the water comes in too quickly to sink deeper without the aid of pumping machinery. We have also sunk about 2 fathoms on the celebrated Cae Conroy lode, from which 12,000*l.* a year profits have been made, and though the distance sunk is short the improvement in the lode is very perceptible, and in my opinion (as a miner of 30 years' experience) there is nothing wanted here but sinking the shafts to a moderate depth—say, 20 or 30 fathoms—and by driving levels on the course of the lodes, in order that the mines may attain a position unsurpassed by any in the district. In the western part of the sett we have discovered another caunter lode, yielding excellent stones of silver-lead ore, and this in a few fathoms driving will drop into an east and west lode. The lode in this level improves in size and character every fathom driven. At present our progress is slow, not having sufficient men at work.

In conclusion, let me briefly sum up the remarkable and unusual advantages possessed by these mines in comparison with the great majority of such undertakings.—1st. Its situation being placed in the heart of the great Silurian lead-producing district of Montgomery-shire, where so many large fortunes have been made.—2nd. The large and profitable lodes it contains, being the focus of all the productive lodes of the neighbourhood.—3rd. The easy terms on which you lease the property, the royalty being only 1-15th.—4th. The great facilities you possess for successfully prosecuting the opening out of the property, having abundance of water at your command, ample accommodation for carriage of ore and materials by water and land, and plenty of labour to be obtained cheaply.

I estimate that about 4000*l.* is required to bring the mine into a profitable state of working, but one year's operations on a moderate course of ore will leave sufficient profit to reimburse this outlay. There is no reason why the West Rhoswyddol Mines should not give similar results to those obtained of its neighbour, Van, which, after only a few hundred pounds had been really expended upon it, was sold for 30,000*l.* to a London company about two years ago, and which is now selling at about 1,030,000*l.*, showing a profit of one million sterling to its bold and fortunate purchasers. You do not require capital to find the lodes—they are found; neither do you require money to search for the productive parts of them—the ore is in sight. The additional outlay is only wanted to open out and enhance the value of the mines."

Applications for shares and all other information to be made to Messrs. Liscombe and Co., 39, South Castle-street, Liverpool.

CAMBORNE, *July* 6.—The Mine Market has been active throughout the week for stock, at advanced prices; those principally dealt in have been North Roskear, North Crofty, South Crofty, Carn Brea, Cook's Kitchen, Tincroft, South Condurrow, Wheal Agar, Wheal Uny, Dolcoath, Carn Camborne, West Frances, South Frances, Wheal Buller, West Basset, East Lovell, Trumpet Consols, Great Wheal Vor, Rosewall Hill, and Wheal Margaret. North Roskear shares have risen from 12 to 25 within a week; they leave off flat at 21, sellers; from good authority there is no improvement in the mine to warrant such a rise, but the prospects are gradually improving, and ere long they will have a good mine. North Crofty, 2¼ to 2⅝, with an enquiry. South Crofty, 19 to 19⅛, firm; a good deal of business has been transacted in these shares, and before long they will see a much better price than at present. Carn Brea, 140 to 142, firm; this is a good investment for capital at present market prices; they are increasing their returns of tin and copper considerably, and reducing the cost since the new management has taken on, and it is supposed that at the next meeting, which is due on Aug. 24, there will be a dividend declared of not less than 5*l.* per share. Cook's Kitchen, 28½ to 29; the meeting is to be held on the 13th instant, and a dividend of 15*s.* per share is expected. Tincroft, 52 to 53; the mine is looking exceedingly well. South Condurrow, 5⅛ to 6, firm, and shares being scarce for delivery, is causing the demand; there is no alteration in the mine, although looking well. Wheal Agar, 20*s.* to 25*s.*; Wheal Uny, 8¼ to 8½, firm; this is a good mine for investment; a dividend of 6*s.* per share was declared on Tuesday last, and the report good. Dolcoath, 180 to 185, and a good demand prevails for these shares in the immediate neighbourhood, and will soon go to 200. Carn Camborne, 4½ to 4¾; the meeting takes place on Wednesday. West Frances, 51 to 53; South Frances, 37 to 39; Wheal Buller, 6 to 7, with an enquiry; West Basset, 2¾ to 2⅞. East Lovell, 13½ to 14; the mine has considerably fallen off in value lately. Trumpet Consols, 27 to 29; Great Wheal Vor, 10 to 10½; Rosewall Hill and Ransom United, 21*s.* to 23*s.*; Wheal Margaret, 15 to 16.

NORTH ROSKEAR.—This old and for many years rich copper mine is now opening out equally good in the bottom levels for tin. The winze sinking below the 240, west of Doctor's, is worth for tin 30*l.* per fathom. The 250, driving towards this winze, and only 6 fms. from it, is worth 20*l.* per fathom, and is improving daily. The engine-shaft sinking below the 250 is worth 18*l.* per fm., and also improving. The returns now equal the costs, and no doubt as soon as ground can be opened will greatly exceed them. The plant is equal to the best in the county, and of sufficient power for many years to come. It is believed by the most eminent authorities that the granite rock will soon be reached by sinking, as the indications strongly resemble those at Dolcoath previous to their great discovery of tin. The mine is in 695 shares only, and held largely by the Messrs. Williams and other well-known Cornish shareholders.

NORTH LOVELL bids fair to turn out one of the prizes of the Wendron district. In sinking the shaft from the 12 to the 22 they have had tin nearly all the way down, some parts being very rich work. At the 22 they have driven on one of the lodes (one of the East Lovell lodes) about 6 fms., and found it very rich for tin, some of the stuff having been assayed produced the extraordinary amount of 16 cwts. 2 qrs. 10 lbs. of black tin to 1 ton of ore. The engine-shaft is being sunk with all speed by nine men through a lode producing fine work for the stamps, and when the 32 is reached it is intended to drive east and west to intersect two of the north lodes; about 10 fms. driving will intersect the first one, and there will be about the same distance to drive to intersect the second one. From the appearance of these lodes as deep as they have been seen from surface, and from the great amount of workings carried out by the ancients on the backs, there is no doubt of large deposits of tin being found, and the result will be a very profitable mine. There is a pile of rich ore at surface at the present time, and as they are daily adding to it, it may be presumed that it will not be very long before the welcome sound of the stamps is heard. It is the opinion of practical miners in the locality that this mine will turn out as successful as its neighbours, East Lovell and Trumpet Consols, the former adjoining this sett, and several of its lodes and its cross-course passing through it. The present party have gone to work in a proper miner-like manner, having erected a 50-in. cylinder steam-engine of sufficient power to enable them to sink the shaft 100 fms. deep. There are more than a dozen lodes in the sett, all lying within a few fathoms of each other, so that they can be easily reached when the levels are extended north; some of these lodes have been very extensively wrought on by the agents to the depth of 10 fms., but as they had no means of keeping the water under they had to leave the riches below, which the present party will be able to secure if they continue to prosecute the development of this undoubtedly rich sett in the spirited manner they commenced and are now doing.

CARADON AND PHŒNIX CONSOLS.—The prospects of the mining undertaking carried on by this company, near Berriow Bridge, North Hill, Cornwall, have greatly improved, and there is now every indication that the enterprise of the proprietary will issue in a valuable and remunerative concern. Situated at the base of one of the celebrated Caradon Hills, where many a rich mine is in existence, the mine, being in such a metalliferous region, was started with the strongest assurances of success, and it is satisfactory to the shareholders to find that the anticipations of success attending their operations are being realised, and the outlay of money proved to have been amply justified. The driving operations are being carried into one of the highest hills of the Caradon district, and it is thought that the lodes developed are intersected by the same cross-course which produced such splendid results in the South Caradon Mine. A fine yield of blende, the mineral from which zinc is manufactured, has recently been laid open, the lode producing it being from 6 to 8 ft. wide, with a solid leader of blende, producing 3 tons per fathom. The blende is very rich in quality, and equals in value the average price of copper ore. The yield of ore having recently increased to a great extent, and the appliances for preparing it proving inadequate, it was deemed prudent to erect a crusher, to enable them to prepare the ore more rapidly for market; and on Monday last the crusher was set to work in the presence of Mr. C. Pearson (manager of the mine), Mr. Ching (Mayor of Launceston) chairman of the company, Mr. W. Pethybridge and Mr. Hawkins (two of the directors), Alderman Derry (Launceston), Captain Kelly, Mr. S. Seccombe, Mr. W. Langdon (ironfounder), under whose direction the crusher has been erected, Mr. Johns, of Southampton, and also several shareholders in the mine. A dinner in celebration of the event was afterwards held at the hotel, in Northhill, under the presidency of the Mayor of Launceston. Among those present, in addition to those already named, were Messrs. H. Short (the secretary), H. Couch, Trebartha, W. R. Bray, Best, Buckingham, &c.—The Chairman, in proposing "Success to the Mine," expressed his satisfaction that the mine was now assuming a very prosperous appearance. He had gone into the affair with a legitimate intention, with the hope to benefit thereby. He did not understand share broking, nor had he any sympathy with it. They had now a good prospect in view, for which they were indebted to

much to Mr. Pearson and Capt. Kelly, who had conducted the operations in a very judicious manner, and had endeavoured to spend every penny in a proper way.—Mr. Pearson, in responding to the toast of his health, said he had from the commencement felt the strongest confidence that the mine would turn out well, and when others had become dispirited he had persevered with the undertaking to the utmost of his ability, and he believed that now they were out of their trouble.—Capt. Kelly, in responding to his health, said he had had 30 years experience in the Caradon and Wheal Maria districts, and he had the most favourable expectations from the present aspect of the mine. He thought it highly probable that they were very near the cross-course on No. 2 lode. Everything showed signs of making a lode in depth. In going west they had driven through 16 fms. of very profitable ground, "good for ore to live in." They had discovered something which he hoped would last for scores of years after they were in their graves.—Mr. Pethybridge, in responding for the directors, said he had taken steps in connection with the erection of the crusher, having full confidence in the mine, and he anticipated the best results from their operations.—Mr. S. Seccombe, of East Caradon, stated that he had seen nothing more promising than the produce of the Caradon and Phœnix Mine.—The meeting was also addressed by Messrs. Derry, Short, and others, and the party separated highly encouraged with the satisfactory aspect which the mine had assumed.

COAL TRADE.—Mr. J. R. Scott, the Registrar of the London Coal Market, has published the following statistics of imports and exports of coal into and from the port and district of London by sea, railway, and canal during June, 1871:—

| By Sea. | Ships. | Tons. |
|---|---|---|
| Newcastle | 203 | 112,142 |
| Seaham | 12 | 2,946 |
| Sunderland | 74 | 42,066 |
| Middlesborough | 11 | 4,280 |
| Hartlepool | 80 | 24,387 |
| Scotch | 12 | 3,045 |
| Welsh | 8 | 2,284 |
| Yorkshire | 23 | 2,284 |
| Small coal | 2 | 659 |
| Cinders | 4 | 409 |
| Total | 429 | 194,502 |
| Imports in June, 1870. | 520 | 215,451 |

| By Railway and Canal. | Tons cwt. |
|---|---|
| London and North-Western | 64,134 12 |
| Great Northern | 72,626 0 |
| Great Western | 42,631 10 |
| Midland | 108,133 0 |
| Great Eastern | 68,304 2 |
| South-Western | 2,617 15 |
| London, Tilbury, & Southend | 23 0 |
| South-Eastern | 747 4 |
| Grand Junction Canal | 353 5 |
| Total | 359,550 8 |
| Imports in June, 1870 | 235,345 8 |

COMPARATIVE STATEMENT, 1870 AND 1871.

| By Sea. | Ships. | Tons. |
|---|---|---|
| Jan. 1 to June 30, 1871. | 2937 | 1,381,436 |
| Jan. 1 to June 30, 1870. | 3340 | 1,494,511 |
| Decrease in pres. year.. | 403 | 113,075 |

| By Railway and Canal. | Tons. cwts. |
|---|---|
| Jan. 1 to June 30, 1871 | 2,192,912 19 |
| Jan. 1 to June 30, 1870 | 1,863,350 9 |
| Increase in present year.. | 329,562 10 |

THE TIN TRADE.—Mr. L. Th. van Houten (Rotterdam, June 30)—Throughout this month tin has been in active demand for export, in consequence of which prices have considerably advanced, the market being rather quieter at the close. Banca was selling at 75¾ fl. in the beginning of the month, but the continued enquiry, partly from France, caused an improvement to 79 fl. Ex the autumn sale a few transactions are reported at 76¾ fl. to 77 fl. The supply of Billiton is much reduced, and with a strong demand the price advanced from 75 fl. to 78 fl., closing at 77¾ fl.: 7800 peculs Billiton offered in public sale at Batavia on June 5 fetched the average price of 80 15 fl., costing to sell here about 74 fl. The position of Banca tin in Holland on June 30, according to the official returns published by the Dutch Trading Company, was—

| | | 1871. | 1870. | 1869. |
|---|---|---|---|---|
| Import in June | Slabs | 16,864 | 24,825 | 3,173 |
| Total six months | | 66,714 | 114,477 | 41,414 |
| Deliveries in June | | 18,300 | 12,626 | 4,500 |
| Total six months | | 87,449 | 73,516 | 48,951 |
| Stock second-hand | | 64,242 | 66,195 | 96,569 |
| Total stock | | 130,244 | 164,614 | 133,736 |
| Stock of Billiton | | 6,151 | 4,173 | 7,814 |
| Import in June | | 10,300 | 8,198 | 6,100 |
| Delivered and shipped in June | | 18,800 | 10,725 | 5,200 |
| Quotation June 30.. Banca | | 79 fl. | 78½ fl. | 79 fl. |
| Quotation June 30.. Billiton | | 77¾ | 77 | 77½ |

These returns compared with those of 1870, exhibit—A decrease of the import for June of 249 tons, a decrease of the import for the six months of 1493 tons, an increase of the deliveries for June of 177 tons, an increase of the deliveries for the six months of 435 tons, a decrease of the stock second-hand of 61 tons, a decrease of the unsold stock of 1013 tons, a decrease of the total stock of 1074 tons, and an advance of the quotation of Banca of ⅛ fl., equal to 16s. 6d. per ton. The quantity of Banca tin now afloat for the Dutch Trading Company is 14,600 peculs, equal to 912 tons, against 12,800 peculs, equal to 800 tons last year. We estimate the quantity of Billiton tin now afloat at 7999 peculs, equal to 500 tons, against 8645 peculs, equal to 540 tons last year. The Government returns for the month of April are as follows:—

EXPORT OF TIN FROM HOLLAND.

| | April. | | | Four months. | | |
|---|---|---|---|---|---|---|
| | 1871. | 1870. | 1869. | 1871. | 1870. | 1869. |
| Germany ..Tons | 453 | 305 | 119 | 974 | 771 | 680 |
| England | 152 | 76 | 8 | 515 | 312 | 213 |
| Belgium } France } | 135 | 325 | 52 | 860 | 921 | 667 |
| Hamburg | 49 | 16 | 12 | 72 | 32 | 41 |
| United States | — | 3 | — | — | 19 | 18 |
| Other countries.. | 42 | 20 | 30 | 71 | 30 | 39 |
| Total ..Tons | 831 | 745 | 221 | 1992 | 2085 | 1668 |

COPPER.—J. Pitcairn Campbell and Co. (Liverpool)—The active demand for copper noticed in our last has continued, and it is manifest that consumption is going on most satisfactorily. Without much speculation, the sales have been very large, and prices of Chili bars are again 20s. to 30s. higher. Quotations for Chili produce are bars 66*l.* 10s. to 68*l.*, ingots 72*l.* 10s. to 74*l.*, ores and regulus 13s. 9d. to 14s., Corocoro Barilla 15s. to 15s. 3d. per unit. Business transacted during the fortnight comprises on the spot here 1826 tons bars, at 65*l.* to 68*l.* per ton; 250 tons ingots, at 73*l.* to 74*l.* per ton; 200 tons ore, at 13s. 9d. per unit; and 136 tons Barilla, at 14s. 10½d. per unit. To arrive, or with extra prompt, 690 tons bars, at 66*l.* to 67*l.* 10s. per ton. At Swansea, 275 tons bars, at 66*l.* 5s. to 67*l.* 10s. per ton; 700 tons regulus and 200 tons to arrive, at 13s. 9d. per unit; 1330 tons Cape and Newfoundland ore sold by private tender, at 13s. 6d. to 13s. 9d. per unit: and at the public sale 2040 tons ore, average produce 16 per cent., average price 13s. 4d. per unit. Arrivals here during the fortnight of West Coast, S.A., produce—North Glen, from Carrizal, 823 tons regulus; Santa Lucia, from Lota, 917 tons bars; Cambrian, from Valparaiso, 66 tons bars; Don Guillermo, from Tome, 200 tons bars; Cordillera, from Valparaiso, 180 tons bars and 110 tons ingots; Germany, from Arica, Chanaral, Coquimbo, and Valparaiso, 63 tons ores, 160 tons bars, 300 tons ingots, and 59 tons Barilla (transit). At Swansea—Tamaya, from Chanaral, 680 tons ores and 80 tons bars; Foxhound, from Caldera, 630 tons regulus. Stocks of copper (Chilian and Bolivian) in first and second hands, likely to be available, are—

| | Ores. | Regulus. | Bars. | Ingots. | Barilla. |
|---|---|---|---|---|---|
| Liverpool | 1356 | 2720 | 11,300 | 1475 | 195 |
| Swansea | 3079 | 5014 | 3,973 | 173 | 222 |
| Total | 4435 | 7734 | 15,273 | 1630 | 417 |

Representing about 21,500 tons fine copper, against 18,100 tons fine copper June 30, 1870; 12,800 tons June 30, 1869; 8700 tons June 30, 1868.—The stock of fine copper on June 15 was 21,900 tons, and not 20,900 tons, as printed in error in our circular.

CHEMICALS AND MINERALS.—(Messrs. J. Berger Spence and Co., Manchester, July 5.)—Soda: Cream caustic steady, at 12*l.* 15s. to 13*l.* 5s.; white, 60 per cent., 13*l.* 10s. to 14*l.*; soda ash firm, at 2¼d. to 2½d.; soda crystals, fair demand, at 5*l.* 10s. to 5*l.* 15s.; bi-carbonate, 12*l.* to 12*l.* 10s.; salt cake, 3*l.* 5s. to 3*l.* 7s. 6d.; Glauber salts, 3*l.* 2s. 6d.—Nitrate of Soda: At 14*l.* to 14*l.* 5s.—Potash: Muriates, for 80 per cent., slight enquiry, and prices firm, at 9*l.*, f.o.b.; potashes, 33s.; pearl ashes, 45s.; Prussiate, red, 2s. 2½d. to 2s. 3d.; yellow, 1s. 3½d. to 1s. 4d.; chlorate, 1s. 4d. to 1s. 5d.—Saltpetre: Foreign, 29s. to 31s.; refined, 33*l.* to 34*l.*—Alum: At 6*l.* to 6*l.* 5s. for loose lump; in export barrels, 7*l.*; ground, 7*l.*—Bleaching Powder: Unchanged, at 12*l.* 10s. to 13*l.*—Ammonia: White and grey, at 18*l.* to 19*l.*; brown, 14*l.* to 14*l.* 5s.; carbonate, 6½d.—Iron Salts: Green and rusty copperas, slacker, at 52s. 6d. to 55s.; dry copperas, 52s.; chloride of iron, 6*l.*—Copper Salts: Sulphate of copper, 23*l.* 10s. to 24*l.*—Arsenic: At 6*l.* 15s. to 7*l.* 5s. for fine powdered.—Acid: Tartaric, improving, at 1s. 4d. to 1s. 4½d.; oxalic, 9½d. to 10d.; sulphuric, 3*l.* 10s. to 3*l.* 15s.; carbolic, 1s. 1d. to 1s. 2d.—Magnesia: Epsom salts, 4*l.* 10s. to 4*l.* 17s. 6d for refined.—Oils: Olive, 44*l.* to 47*l.*; pindle, loom, and dense oils, 4s. to 5s. 6d.; pure white Norwegian cod liver oil, 4s. 6d. to 6s. per gallon.—Pitch: Dull, at 13s. to 15s.—Benzole: Improving and firm; 20 per cent., at 3s. 3d.; 50 per cent. to 90 per cent., at 4s. to 4s. 6d.—Disinfectants: Patent, 5*l.*; carbolic, 10*l.*—China Clay: 22s. per ton.—Pyrites: Active business, at 7d. to 8d. for Spanish.—Phosphates: Super-phosphates, 25 to 30 per cent., 3*l.* 10s.; precipitated phosphate of lime, 40 to 50 per cent., 5*l.* 10s. to 6*l.* 10s.; Estramadura, 1s. 2d. per unit; mineral phosphates, 55 to 60 per cent., 10¼d. per unit.—Manganese: 70s. to 90s. for 60 and 70 per cent.—Iron Ore: Hematite, 19s. to 20s.; oolitic, 6s. 9d. to 7s. 6d.—Iron: "Ayresome" Yorkshire pig-iron firm, No. 1, 51s. 6d.; No. 2, 49s. 6d.; No. 3, 48s.; No. 4 (Foundry), 47s. No. 4 (Forge), 47s. net cash, or 1s. extra four months; Scotch pig steady, at 57s. 6d. to 58s.; Welsh bars, 6*l.* 15s. to 7*l.*; Staffordshire bars, 7*l.* 10s. to 8*l.*; hoop iron, 8*l.* 10s.; gas tubes, 60 to 67½ per cent. off list; boiler tubes, 40 to 42½ per cent.—Copper: Further improved; English tough ingot, 74*l.* to 74*l.* 10s.; Chili bars, 67*l.* 10s. to 68*l.*—Tin: Selling freely; English, 134*l.* to 134*l.* 10s.; Straits, 133*l.* to 133*l.* 10s.—Tin-plates: Coke, IC, at 23s. to 24s.; charcoal, IC, 28s. to 30s. per box.—Lead: Unaltered; best English soft pig, 18*l.* 5s. to 18*l.* 10s.—Antimony: French star, 49*l.* to 50*l.*—Spelter: Improving in value; Silesian, special brands, 18*l.* to 18*l.* 10s.; English, 18*l.* 10s. to 19*l.*

Messrs. C. Gregory Penney and Co. (Liverpool) say—"During the past quarter we have to report a strong demand in every branch of the alkali trade. In our April circular we had occasion to note an advance in price, with every indication of still higher prices, and, as we expected, there has been a considerable advance; this has not been confined to the alkali trade alone, other chemical manufactures have also shared in it, and in some articles the rise has been enormous."

MANUFACTURE OF WIRE.—The invention of Messrs. R. HILL, A. T. WARD, and C. F. CLAUS, Middlesborough, consists in annealing or softening wire by immersing the same in a bath or flux heated to the necessary temperature. In this bath the wire remains until it has acquired the same temperature and has become annealed. A portion of the flux will necessarily adhere to the wire or other articles, forming a coating which will continue to protect the metal from oxidation until it is cold. When cold the coating of the flux is removed from the annealed articles by means of hot or cold water. The inventor prefers to use a flux formed of chloride of calcium, hydrate of soda, and silicate of soda.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FLANGED & COMBUSTION-CHAMBERED
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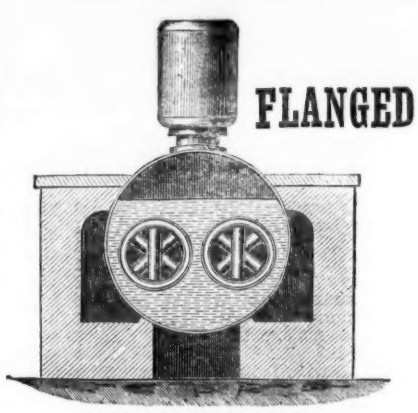
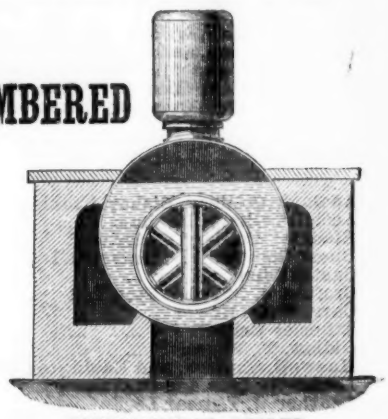
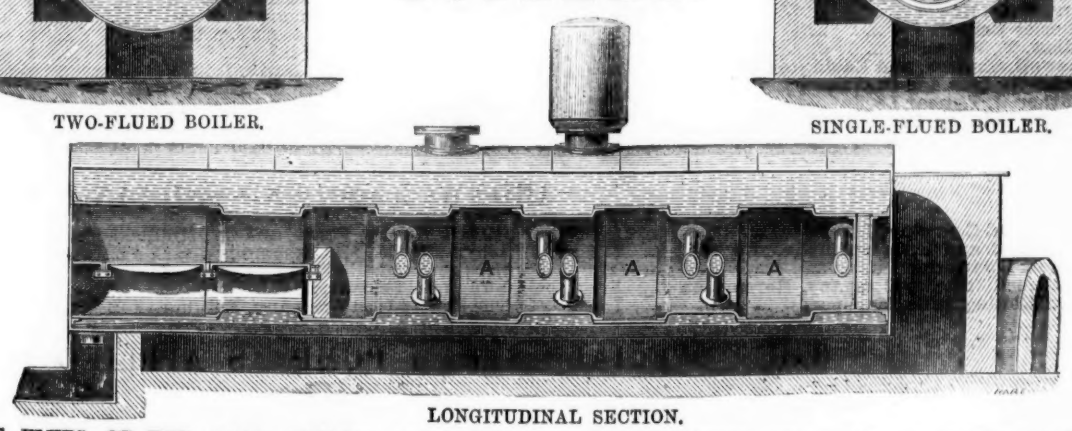
BOILERS.


TWO-FLUED BOILER.


SINGLE-FLUED BOILER.



LONGITUDINAL SECTION.

THE FLUES OF THE ABOVE BOILERS ARE MADE OF TWO DIAMETERS, ONE RING OF PLATES BEING 4 inches less than the other, alternately.
The smaller rings being flanged, as shown in drawing, are thereby considerably strengthened, besides securing the most material point—a perfect EXPANSION-JOINT.
The cross tubes are placed in the smaller rings of the flue, so that any one can easily be taken out and replaced.
The larger rings of the flue act as reverberating, combustion, and heat-retaining chambers, greatly economising the fuel.
These Boilers are strong, durable, and economical, and have been at work a number of years with the most satisfactory results.

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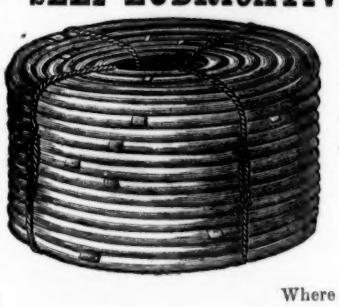
SELF-LUBRICATIVE STEAM & HYDRAULIC ENGINE PACKING.



This Packing is invaluable to all Users of Steam-Power; it supersedes anything of the kind ever invented; it is now in use in all the Chief Railways and First Firms in this Country and Abroad, and is
THE ONLY PACKING THAT WORKS WITHOUT OIL OR GREASE,
Does not char, is pliable, keeps the rods
COOL, BRIGHT, AND CLEAN,
And lasts longer than any other, thereby
SAVING FULLY 200 PER CENT.
To the User, in oil, labour, and material.
Can be had only from the Agents throughout the country, appointed by
THE SOLE LICENSEES,
HENRY HOUSE AND CO.,
CATHERINE STREET, CITY ROAD, LONDON, E.C.
Where also may be obtained, the LUBRICATIVE PACKING COMPANY'S
ANTI-FRICTION CREAM OIL,
Which Lubricates perfectly, keeps the Bearings Cool, and does not become Viscid or Glutinous.

CHAS. PRICE AND CO.'S RANGOON ENGINE OIL,
AS SUPPLIED TO H.M. DOCKYARDS AND FLEET.

THIS OIL is suitable to every kind of Machinery. As a lubricant it is equal to the best Sperm or Lard Oil, while it possesses the great advantage of being entirely free from any principle which will corrode the metal bearings.
For particular kinds of Machinery, the Oil may be specially prepared of a consistency and character adapted to the nature of the work to be done.
"Chemical Laboratory, 7, Printing House-square, Blackfriars, April, 1869.
"I herewith certify that the Rangoon Engine Oil, manufactured by Messrs. Chas. Price and Co., is free from any material which can produce corrosion of the metal work of machinery. It is indeed calculated to protect metallic surfaces from oxidation.
"The lubricating power of this oil is equal to Sperm or Lard Oil.
"T. W. KEATES, F.C.S., &c. &c
Every parcel of the Oil sent from the works bears the Trade Mark of the Firm.
LONDON: CASTLE BAYNARD, UPPER THAMES STREET.
WORKS: MILLWALL, POPLAR.

# TANGYE BROTHERS AND HOLMAN,

## 10, LAURENCE POUNTNEY LANE, LONDON,

### CORNWALL WORKS (TANGYE BROTHERS), BIRMINGHAM,

SOLE MAKERS OF

# THE "SPECIAL" STEAM PUMPS.

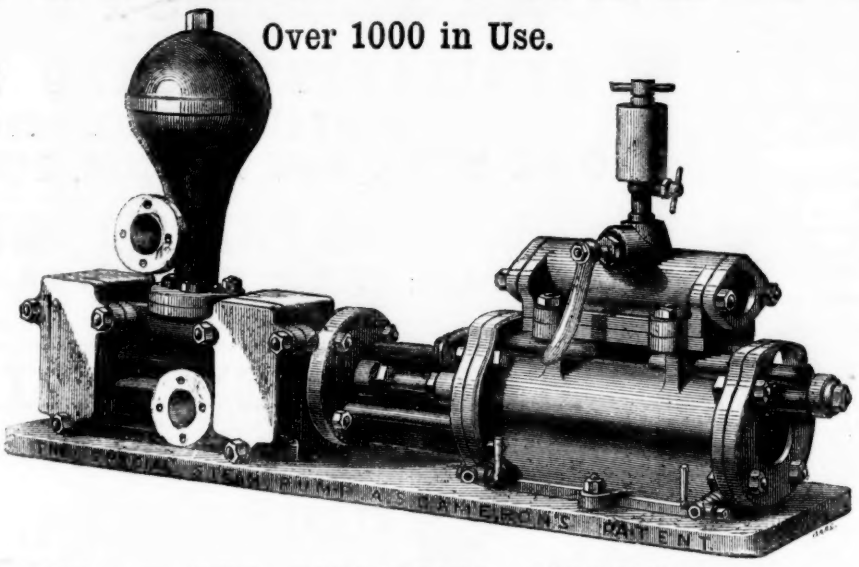
Over 1000 in Use.

**IN USE AT THE FOLLOWING QUARRIES:—**

| | | |
|---|---|---|
| Carnarvon and Bangor Slate Co. ... | 5 | Pumps. |
| Kellow, J. E., North Wales Slate Co... | 1 | „ |
| New Zealand Quartz Crushing and Gold Mining Company... ... ... | 1 | „ |
| Scott, R. W., Dungannon, Ireland ... | 1 | „ |
| Foster, J. S., Hebburn Quarries ... | 1 | „ |

**IN USE AT THE FOLLOWING CHEMICAL WORKS:—**

| | | |
|---|---|---|
| Alum and Ammonia Co., Bow Common | 2 | Pumps. |
| Barnes, W. C., Hackney Wick... ... | 2 | „ |
| Burt, Boulton, and Hayward, Tar Works, Millwall ... ... ... ... | 1 | „ |
| Cory and Co., Manor-street, Old Kent-road ... ... ... ... ... ... | 2 | „ |
| Whiffen, Thomas, Battersea ... ... | 1 | „ |
| Jones, W., and Co., Middlesborough... | 4 | „ |
| Jarrow Chemical Co., South Shields.. | 1 | „ |
| Richardson, J. G. and N. H., Jarrow-on-Tyne ... ... ... ... ... | 1 | „ |
| Read, Holliday, & Sons, Huddersfield | 1 | „ |
| Sheldon, Nixon, and Co., West Jarrow | 2 | „ |
| Tennant, C., and Co., near Newcastle. | 7 | „ |
| Webb, H., & Co. (Manure), Worcester | 1 | „ |
| Union Chemical Company, Stratford.. | 1 | „ |




**NOTE.**

Requires NO Shafting, Gearing, Riggers, or Belts.

All Double-Acting.

Works at any Speed, and any Pressure of Steam.

Will Force to any Height.

Delivers a constant stream.

Can be placed any distance away from a Boiler.

Occupies little space.

Simple, Durable, Economical.

## IN USE AT THE FOLLOWING COLLIERIES:—

| | | |
|---|---|---|
| Adelaide Colliery, Bishop Auckland ... ... | 3 | Pumps. |
| Acomb Colliery, Hexham ... ... ... ... | 1 | „ |
| Blackfell Colliery, Gateshead ... ... ... | 1 | „ |
| Black Boy Colliery, Gateshead ... ... ... | 1 | „ |
| Castle Eden Colliery ... ... ... ... ... | 2 | „ |
| Crofton, J. Ct., near Ferryhill ... ... ... | 1 | „ |
| Carr, W. C., Newcastle ... ... ... ... | 4 | „ |
| Etherley Colliery ... ... ... ... ... | 1 | „ |
| Gidlow, T., Wigan ... ... ... ... ... | 3 | „ |
| Haswell, Shotton, and Easington Coal Co. ... | 2 | „ |
| Lochgelly Iron and Coal Company ... ... | 1 | „ |
| Leather, J. T., near Leeds ... ... ... ... | 2 | „ |
| Lumley Colliery, Fence Houses ... ... ... | 1 | „ |
| Monkwearmouth Colliery, Sunderland... ... | 1 | „ |
| North Bitchburn Colliery, Darlington ... ... | 2 | Pumps. |
| Newton Cap Colliery, Darlington... ... ... | 1 | „ |
| Normanby Mines ... ... ... ... ... | 1 | „ |
| Oakenshaw Colliery ... ... ... ... ... | 1 | „ |
| Pease's West Colliery ... ... ... ... | 2 | „ |
| Pease, J. and J. W., near Crook ... ... ... | 5 | „ |
| Pease, J. and J., Brandon Colliery ... ... | 1 | „ |
| Pegswood Colliery, near Morpeth ... ... | 2 | „ |
| Pelton Fell Colliery ... ... ... ... ... | 1 | „ |
| Railey Fell Colliery, Darlington ... ... ... | 1 | „ |
| Right Hon. Earl Durham, Fence Houses ... | 1 | „ |
| Skelton Mines ... ... ... ... ... ... | 1 | „ |
| South Benwell Colliery ... ... ... ... | 4 | „ |
| St. Helens (Tindale) Colliery ... ... ... | 1 | „ |
| Stott, James, and Co., Burslem ... ... ... | 1 | Pumps |
| Seaton Delaval Coal Company, near Newcastle | 1 | „ |
| Thornley Colliery, Ferryhill ... ... ... | 1 | „ |
| Thompson, John, Gateshead ... ... ... | 2 | „ |
| Trimdon Grange Colliery ... ... ... ... | 1 | „ |
| Tudhoe Colliery ... ... ... ... ... | 4 | „ |
| Vobster and Mells Colliery ... ... ... ... | 2 | „ |
| Widdrington Colliery, Morpeth ... ... ... | 2 | „ |
| Whitworth and Spennymoor Colliery ... ... | 3 | „ |
| Westerton Colliery, Bishop Auckland ... ... | 1 | „ |
| Wardley Colliery, Gateshead ... ... ... | 1 | „ |
| Westminster Brymbo Coal Company ... ... | 2 | „ |
| Weardale Coal and Iron Company ... ... | 5 | „ |

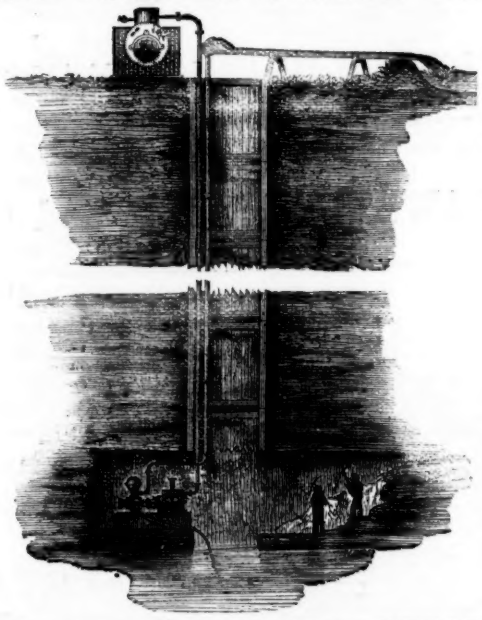
## IRONWORKS AND ROLLING MILLS:—

| | | |
|---|---|---|
| Bede Metal Company, Jarrow ... ... ... | 11 | Pumps. |
| Bagnall, C. and T., Grosmont Ironworks ... | 2 | „ |
| Consett Ironworks ... ... ... ... ... | 2 | „ |
| Castleford Foundry Company, Normanton ... | 1 | „ |
| Ellen Rolling Mills, Maryport ... ... ... | 1 | „ |
| Gilkes, Wilson, Pease, and Co., Middlesboro'.. | 2 | Pumps. |
| Lloyd and Co., Middlesborough ... ... ... | 1 | „ |
| Solway Hematite Iron Company, Maryport ... | 1 | „ |
| Vaughan, Thomas, Middlesborough ... ... | 2 | „ |
| The Shotts Iron Company, Edinburgh ... ... | 1 | „ |
| Whitwell and Co., Stockton ... ... ... | 3 | Pumps. |
| Whessoe Ironworks, Darlington ... ... ... | 1 | „ |
| West Cumberland Hematite Iron Company ... | 1 | „ |
| Westbury Iron Company ... ... ... ... | 1 | „ |

## THE "SPECIAL" STEAM PUMP AS APPLIED FOR DRAINING MINES.

The arrangement in the accompanying illustration shows an economical method of draining mines without the expense of erecting surface-engines, fixing pump-rods, or other gearing. A boiler adjacent to the pit's mouth is all that is necessary on the surface; from thence steam may readily be taken down, by means of a felted steam-pipe, to connect the pump with the boiler. The pump may be placed in any situation that may be convenient for working it, and connecting the steam, suction, and delivery pipes.

These engines can be fixed and set to work in a comparatively short time, and also at a very small outlay. They are used in large mines as auxiliary engines, and will be found invaluable adjuncts in all mining operations.



To estimate the quantity of water to be raised by any given size of pump refer to the tabulated list below. It is recommended to use long-stroke pumps where the height exceeds 100 ft., so that the largest result may be obtained with a minimum wear and tear of the pump pistons and valves. The pumps are provided with doors for ready access to all working parts.

## PRICES OF THE "SPECIAL" STEAM PUMPS.

| Diameter of Steam Cylinder ..... inches | 2½ | 3 | 4 | 4 | 6 | 6 | 6 | 7 | 7 | 7 | 8 | 8 | 8 | 8 | 10 | 10 | 12 | 12 | 14 | 16 | 26 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Diameter of Water Cylinder ..... inches | 1¼ | 1½ | 2 | 4 | 3 | 4 | 6 | 5 | 6 | 7 | 4 | 6 | 7 | 8 | 6 | 7 | 8 | 10 | 8 | 7 | 6½ |
| Length of Stroke ..... inches | 6 | 9 | 9 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 18 | 12 | 12 | 18 | 24 | 48 | 24 | 72 |
| Strokes per minute ..... | 100 | 100 | 70 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 35 | 50 | 50 | 35 | — | — | — | — |
| Gallons per hour ..... | 310 | 680 | 815 | 3250 | 1830 | 3250 | 7330 | 5070 | 7330 | 9750 | 3250 | 7330 | 9750 | 13,000 | 7330 | 9750 | 13,000 | — | — | — | — |
| PRICE ..... | £10 | £15 | £20 | £35 | £30 | £40 | £47 10 | £50 | £52 10 | £57 10 | £50 | £55 | £65 | £85 | £70 | £80 | £100 | — | — | — | — |

IF BRASS LINED, OR SOLID BRASS OR GUN-METAL WATER CYLINDERS, WITH COPPER AIR VESSELS, EXTRA, ACCORDING TO SIZE.

Any Combination can be made between the Steam and Water Cylinders, provided the Lengths of Stroke are the same, thus—8 in. Steam and 3 in. Water, or 10 in. Steam and 3 in. Water, adapted to height of lift and pressure of steam, and so on.

## TANGYE BROTHERS & HOLMAN, 10, Laurence Pountney-lane, London, E.C.

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